

# Case Study: The Funafuti Conservation Area, Funafuti Atoll, Tuvalu

## *Drawing Lessons for Future Marine Conservation Planning and Management*



(southern end of Funafuti Atoll, looking west)



*prepared for the*  
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## CURRENCY EQUIVALENTS

Currency Unit – Australian dollar (A\$)  
March 2003

A\$1.00 = \$0.676  
US\$1.00 = A\$1.48  
(see Notes)

### **Abbreviations and Terms**

ADB	Asian Development Bank
CA	conservation area
CACC	Conservation Area Coordinating Committee
CBO	community-based organization
CRM	coastal resources management
ENSO	El Niño Southern Oscillation
falekaupule	(Tuvaluan) council of elders
FCA	Funafuti Conservation Area
FTC	Funafuti Town Council
GEF	Global Environment Facility
GOT	Government of Tuvalu
kaupule	(Tuvaluan) town council
km	kilometer
m	meter
maneapa	(Tuvaluan) meeting hall
motu	(Tuvaluan) small islet
MPA	marine protected area
MSY	maximum sustainable yield
NAFICOT	National Fishing Corporation of Tuvalu
NGO	non-governmental organization
PDMC	Pacific Developing Member Country
PRES	Pacific Region Environmental Strategy
SPBCP	South Pacific Biodiversity Conservation Programme
SPREP	South Pacific Regional Environment Programme
sq km	square kilometer
TEKW	traditional ecological knowledge and wisdom
toeaina	(Tuvaluan) elders
TOR	terms of reference
TTF	Tuvalu Trust Fund
UNDP	United Nations Development Programme
yr	year

### **Notes**

- (i) Currency equivalents as specified, unless otherwise noted.
- (ii) In this report, "\$" refers to US dollars, unless specified as A\$, which refers to Australian dollars.

## ***Executive Summary***

1. Marine protected areas (MPAs) have gained wide acceptance among coastal planners, managers, researchers, and scientists as an effective tool that can be utilized to protect threatened marine and coastal ecosystems. MPAs allow depleted breeding stocks of important food fish and invertebrate species to regenerate and become re-established, providing a foundation for sustainable fisheries. Typically, the MPA model comprises a core “no-take” conservation area, within which harvest of fish and other consumable resources is strictly prohibited, and a surrounding “buffer zone” in which non-intensive fishing practices are permitted. The full commitment and participation of the local community in planning, design, and implementation can ensure the long-term viability of such projects.
2. An MPA project, the Funafuti Conservation Area (FCA), was initiated at Funafuti, the main atoll and lagoon system of Tuvalu, in 1996. The FCA was established with the support of the South Pacific Biodiversity Conservation Programme (SPBCP), and administered by the South Pacific Regional Environment Programme (SPREP), in response to reported increases in fishing pressure, and the threat of deteriorating environmental quality in Funafuti lagoon. The FCA has been regarded as highly successful by local residents, but information about the project has not been widely disseminated outside of Tuvalu. As part of the Asian Development Bank (ADB) Pacific Region Environmental Strategy (PRES), a case study was prepared to evaluate the performance of the FCA project. One of the primary objectives of the case study, and of the PRES, was to gather ‘lessons learned’ that could be applied in other contexts, and to determine ways in which environmental management could be effectively mainstreamed into government policy-making and economic planning.
3. Information obtained through review of secondary literature sources provided the initial foundation for the case study. Intensive consultative activities were also carried out in Tuvalu, and included (i) interviews with key informants who were involved in establishing, monitoring, or managing the FCA; (ii) round-table discussions with key stakeholders from the community; and (iii) questionnaires that were distributed to determine sentiment and level of awareness within the community about the FCA and general conservation issues. In addition, direct observations of biophysical conditions in the FCA were made during a series of SCUBA and snorkeling surveys. These field surveys were useful in providing an overview of relative resource abundance, biodiversity, and ecosystem health, and in drawing comparisons between prevailing conditions at sites within and outside the conservation area.
4. Based on the observations made and information gathered during the study, specific findings regarding the performance of the FCA project are as follows:
  - Community members are generally supportive of the FCA. While acknowledging that there are certain weaknesses, they feel that it is producing beneficial results, and that it should be maintained as a no-take zone in which breeding populations of fishes and other organisms can be protected to sustain fisheries resources.
  - Most respondents believe that fish populations have increased within the lagoon as a result of the establishment of the conservation area. Also, during field surveys, high biomass and biodiversity were observed at two of the three sites (Tefala and Fuafatu) visited within the FCA. Significant at these sites was the observation of large-sized

individual fishes of highly-prized target food species, such as groupers and snappers. The presence of so many large fish of desirable target food species appears to indicate that there is very low fishing pressure at these sites.

- While observations of high biodiversity and biomass were impressive at the FCA sites, these parameters also appeared to be roughly comparable at other sites outside the conservation area (South Fongafale and Tepuka). However, the sites within the FCA still appeared to have larger-sized individual fishes among the key target food species, than at the sites outside the FCA.
- Two possible explanations for the fact that fish stocks at sites within and outside the FCA are almost the same in terms of abundance and diversity are: (i) the FCA is already functioning effectively as a source of biomass, and is exporting 'spillover' biomass to other parts of the lagoon; and (ii) fishing pressure is relatively low (ie, below maximum sustainable yield) throughout the lagoon, even outside the FCA.
- During FCA project implementation, intensive awareness-building activities were conducted, and were considered generally effective in improving local knowledge about conservation issues. However, these activities have all but ceased since project ended.
- Monitoring and survey activities conducted as part of the conservation project were helpful in establishing baseline data about species composition and diversity within the FCA. These activities also helped to develop skills among technical staff in the Conservation Office and Fisheries Department. However, in the future, other parameters need to be included, and methodologies need to be improved, in order to strengthen the monitoring process to enable detection of changes brought about through the management of the FCA.
- The FCA project provided an impetus for the passage of the Conservation Area Act of 1998 and of the Funafuti Town Council's by-laws dated 16 December 1999. The national Act establishes a legal framework for declaring conservation areas nationwide, including possible future conservation sites on the outer islands. The by-laws establish the regulations and procedures that govern the use of resources specifically within the FCA. While these are significant steps toward institutionalizing the FCA, an obvious deficiency is the lack of an integrated, community-based management plan for the FCA.
- While respondents and interviewees indicated that the planning of the FCA was carried out with the involvement of the community, they also pointed out that greater community participation will be needed to manage the area effectively over the long term. Presently, two conservation officers are handling practically all responsibilities for the management of the area, with very little assistance coming from the community at large.
- There is a high level of voluntary compliance with restrictions on fishing within the FCA no-take area, but because enforcement efforts are weak, some violations continue to occur. Organized enforcement efforts are hampered by a lack of trained staff, inadequate funding, and anomalies in the legal and judicial system that make it difficult to prosecute violators. Recent incidents of "permitted catches" within the no-take area also undermine conservation efforts.

- No practical mechanisms for sustainable financing were put into place as part of the project. As a result, conservation efforts were cut back severely once project funding from SPREP ceased, resulting in a feeling of frustration and disillusionment among stakeholders.
  - For conservation activities to be sustainable, it is essential that government policy-makers understand fully the significance of the resources being protected, and move toward mainstreaming conservation efforts into the national development and economic agenda. Government's commitment and support for such efforts can help in protecting resources of national importance for present and future generations.
5. Based on the findings of the study, a number of key lessons emerged. The lessons learned from the study of the FCA are consistent with lessons learned from evaluating past MPA projects from other countries. The most significant of the lessons learned from the Funafuti experience are as follows:
- A marine protected area such as the FCA, if successfully managed, can produce important tangible benefits. Among these are (i) increased awareness within the community regarding environmental and conservation issues, (ii) preservation of biodiversity, and (iii) actual increases in fish biomass, resulting in increased sustainable fisheries yields.
  - Traditional systems of fisheries management can form the basis for developing an effective management framework. However, each situation is unique, and needs to be evaluated individually to determine how to best integrate traditional and non-traditional methods into a system that is most appropriate within any specific biophysical, socioeconomic, and cultural setting.
  - Community participation is key to ensuring the long-term sustainability of any marine conservation program. Community participation is especially crucial in the planning and design stages. It is also critical in various aspects of implementation, especially in monitoring and enforcement.
  - Monitoring methods should be developed that can produce the most useful data for measuring changes over time, especially those changes that might be due to improved management and conservation within an MPA. Biomass and fish size distribution are two parameters that are especially important in this regard.
  - A no-take zone cannot be managed in isolation. No-take zones are simply the "core" zones of MPAs. It is important to coordinate the management of these zones with the management of activities occurring in surrounding areas. An ecosystem approach should be used to define the management area (whether it be for a lagoon, a small island ecosystem, a watershed, or other readily identifiable ecological unit). A comprehensive, integrated community-based management plan should be developed to guide activities within the management area.
  - Selecting an area that is not under intensive pressure, either from heavy fishing activity or due to serious environmental impacts (eg, from such influences as pollution or land transformation), increases the chances of successfully maintaining healthy marine biodiversity resources and breeding stocks for fisheries within an MPA. Proper



- management under these conditions can help to protect biodiversity for future generations.
- Sources for sustainable financing need to be identified early in the planning process, and mechanisms put in place to capture revenues that can support management efforts over the long term. Failure to secure sustainable financing can lead to frustration and disappointment, and can ultimately undermine the conservation effort.
  - It is essential that the national and local government give full institutional support for conservation initiatives such as the FCA project, through 'mainstreaming,' which requires inclusion of conservation objectives within overall national and local policy-making and economic planning. Specifically, this entails promulgation of appropriate laws and regulations; establishment of institutional structures that may be required for effective management; development of effective and comprehensive management plans; and identification of fund sources and allocation of funds where needed.
6. A rough calculation of expected costs and benefits for improved management of the FCA was undertaken. Capital costs and recurrent costs for improved management over a five-year timeframe were estimated. The value of benefits was derived from past studies of similar conservation projects. Values such as increased fisheries productivity, the coastal protection function provided by healthy coral reefs, and improved opportunities for ecotourism, ocean recreation and similar revenue-generating activities, were taken into account. The calculation showed an estimated net economic benefit of A\$163,120/year to be realized through more effective management of the FCA. The net benefits to the country could be further multiplied by increasing the size of the management area, or by replicating the conservation project at other sites on other atolls around the country.
  7. Based on the case study findings, a series of recommendations is made for strengthening the management of the FCA. These include improving the monitoring methodology; increasing public awareness; developing an integrated management plan for all of Funafuti lagoon; improving enforcement; building capacity, both within government departments and through strengthening of NGOs and other community-based groups; and developing mechanisms for sustainable financing, especially through promotion of ecotourism and ocean recreation.
  8. It is also recommended that possibilities for replicating conservation areas on the other atolls of Tuvalu should be explored. On several other atolls where traditional management systems have been established, residents represented through their town councils have called for assistance in setting up formal conservation areas. In designing any such management systems, consideration should be given to determining how to best combine traditional and non-traditional management elements. A similar approach should be taken if replication of the FCA model is considered for other Pacific island nations. Possibilities for establishing a regional network, that links conservation areas in various countries, should also be investigated.
  9. The importance of mainstreaming of conservation efforts, so that they are fully integrated into overall national development planning, policy-making, and economic budgeting, cannot be overemphasized. As demonstrated in the cost-benefit analysis, improved protection of fish breeding stocks and related natural resources in MPAs such as the FCA can result in significant net economic benefits for the nation. Working in close collaboration with

community stakeholders, the commitment of the government, in the form of legal, institutional and financial support, is required to ensure that effective management is provided on an ongoing basis.

10. Cross-sectoral linkages provide opportunities to strengthen conservation efforts. In Tuvalu, conservation activities within MPAs can be linked to other activities of the Fisheries Department (for example, using these sites as restocking areas for giant clam and other mariculture products, and for research), to ecotourism development, and to outer islands development (among others).
11. At present the GOT does not have the capacity to fully execute and implement all the activities that are required for optimizing a national marine conservation program. For this reason, it is recommended that a team of specialists provide the required technical assistance to help prepare the community, train assigned personnel, and help coordinate a range of community-based planning, design, and management functions. Outline Terms of Reference have been provided that define the roles of a proposed consultant support team, that would deliver the technical assistance.
12. In summary, the FCA project has been relatively successful, and can provide a useful model for similar marine conservation projects at other sites within the country, around the region, and beyond. It should be noted that the generally low fishing pressure within Funafuti lagoon as a whole is probably a significant contributing factor to the successful results observed within the FCA. This is in sharp contrast to the case in more populous nations, such as the Philippines or Indonesia, where such results are much more difficult to achieve. The success of the FCA project in Tuvalu points precisely to the urgent need, in nations where fishing pressure is presently beyond sustainable limits, to consider all reasonable means to bring these pressures under control. Only if this is done soon, will there be any hope of achieving sustainability of the fisheries resources that are so vital to providing the people of these nations with their basic sustenance.

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## 1. Introduction

Technical assistance was provided by Asian Development Bank (ADB) to the Government of Tuvalu (GOT) as part of the Pacific Region Environmental Strategy (PRES),<sup>1</sup> a regional project for environmental strategic planning. Under the PRES, case studies were prepared to document a range of environmental and natural resources planning and management approaches in Pacific Developing Member Countries (PDMCs), that will be useful to gain improved understanding of such practices in the region.

For the Tuvalu case study, a Coastal Resources Management and Protected Areas Specialist<sup>2</sup> was fielded to Tuvalu during the period 3 March-24 March 2003, to evaluate the performance of the Funafuti Conservation Area (FCA) project, a marine and terrestrial conservation program initiated at Funafuti, the main atoll and lagoon system of Tuvalu, in 1996. The Specialist worked in close coordination with local GOT counterparts, particularly technical personnel in the Conservation Office of the Funafuti Town Council, the Department of Fisheries, and the Department of Environment.

According to local informants, in the relatively short time since its inception, the Funafuti Conservation Area project has demonstrated a measure of success in establishing an effective management framework for the conservation and sustainable use of important fisheries and other coastal resources. It is therefore hoped that the lessons to be learned from this case study may be useful to the Government of Tuvalu when considering possible replication of the management model on other islands. In addition, given the heavy reliance upon nearshore fisheries resources for subsistence and as a source of food protein in most Pacific island nations, and in developing countries in other regions, this analysis may also prove relevant in a wider regional and global context.

## 2. Broader Context: Marine Protected Areas as a Management Tool

Within the Pacific region, and throughout most of the world's developing coastal countries, heavy reliance is placed upon nearshore fisheries resources for subsistence and as a source for nutritional protein. Mounting fishing pressure due to increasing populations in coastal areas, and associated impacts due to pollution, habitat destruction, and large-scale environmental effects (eg, coral bleaching, tied to elevated temperatures believed to be associated with the El Niño Southern Oscillation [ENSO] phenomenon) have resulted in depletion of fisheries resources in many coastal areas. These losses have had the greatest impact upon the poor, who are most directly dependent upon such resources for their survival.

One of the interventions that has been applied in recent years in an effort to reverse the trend of declining fisheries resources is the establishment of marine protected areas (MPAs). The MPA is used as a means for protecting threatened marine and coastal ecosystems and for allowing depleted breeding stocks of important food fish and invertebrate species to regenerate and become re-established. Ideally, following a preparation period that includes significant public awareness-building, the MPA is planned, established and managed with the full commitment and participation of the local community. Such commitment can ensure the long-term viability of such projects.

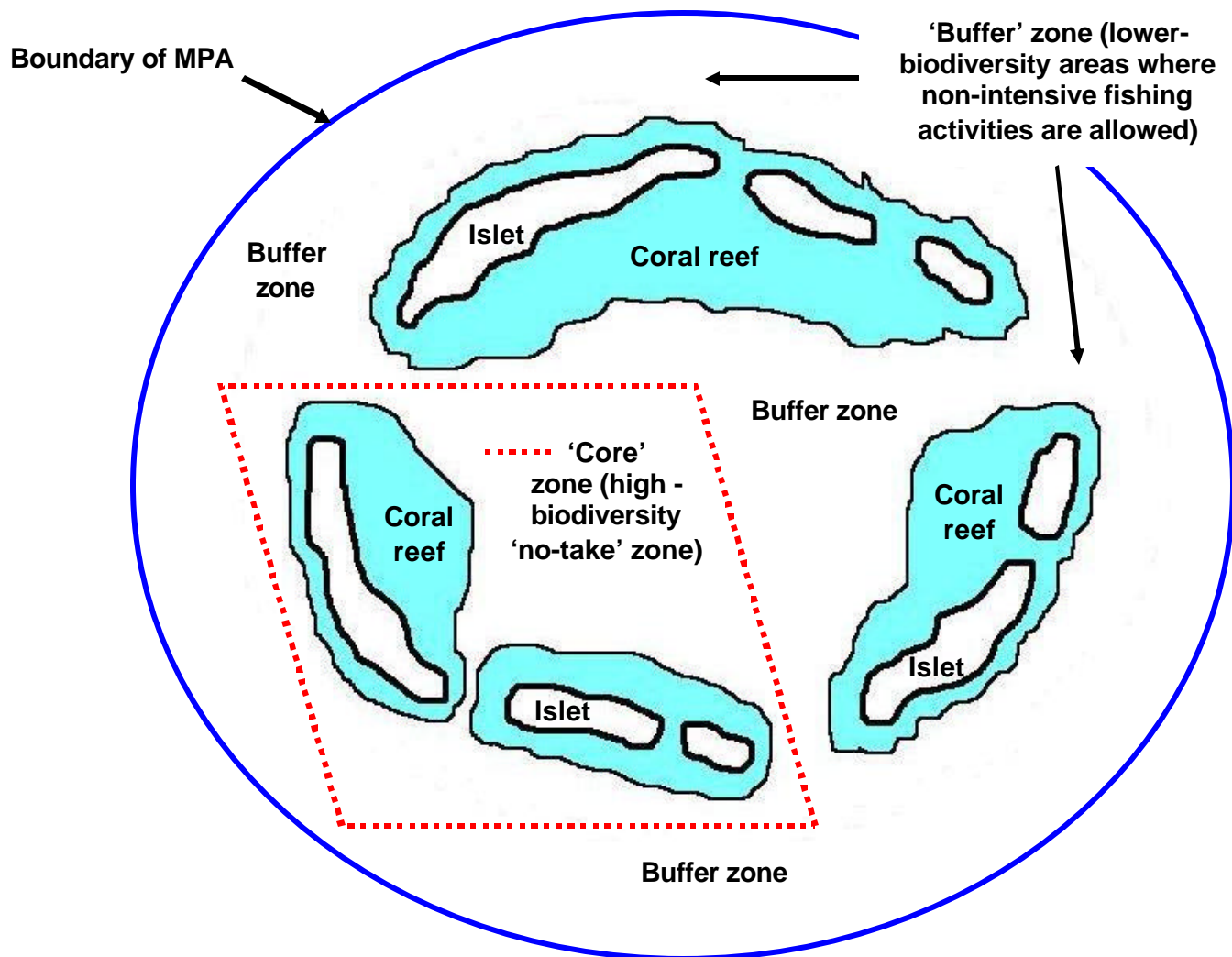
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<sup>1</sup> ADB TA No. 6039-REG.

<sup>2</sup> The lead consultant for the case study is Mr. James T. Berdach

Over the last two to three decades, MPAs have gained wide acceptance among resource managers as an effective tool for conserving fragile marine ecosystems and ensuring the sustainability of important fisheries and other nearshore resources. MPAs established for protection of coral reefs and fisheries resources at Sumilon and Apo islands, in the central Philippines in the mid-1970s, are among the pioneering projects in this field. As developed through these projects, the MPA model comprises a core “no-take” conservation area (CA), within which harvest of fish and other consumable resources is strictly prohibited, and a surrounding “buffer zone” in which non-intensive fishing practices are permitted. Figure 1 presents a diagram for a ‘typical’ MPA, adapted for the lagoon environment.

**Figure 1 Schematic Diagram for a Lagoon Marine Protected Area**



Usually the core zone should include the higher-quality coral reefs and other biodiversity resources contained within the MPA (eg, areas of non-degraded reef of greater structural complexity, such as reef slopes vs. reef flats), and total about 20-30 percent of the total coral reef area. The early MPA projects in the Philippines, and similar projects conducted in the Caribbean, demonstrated the effectiveness of MPAs in preserving a breeding-ground for fishes

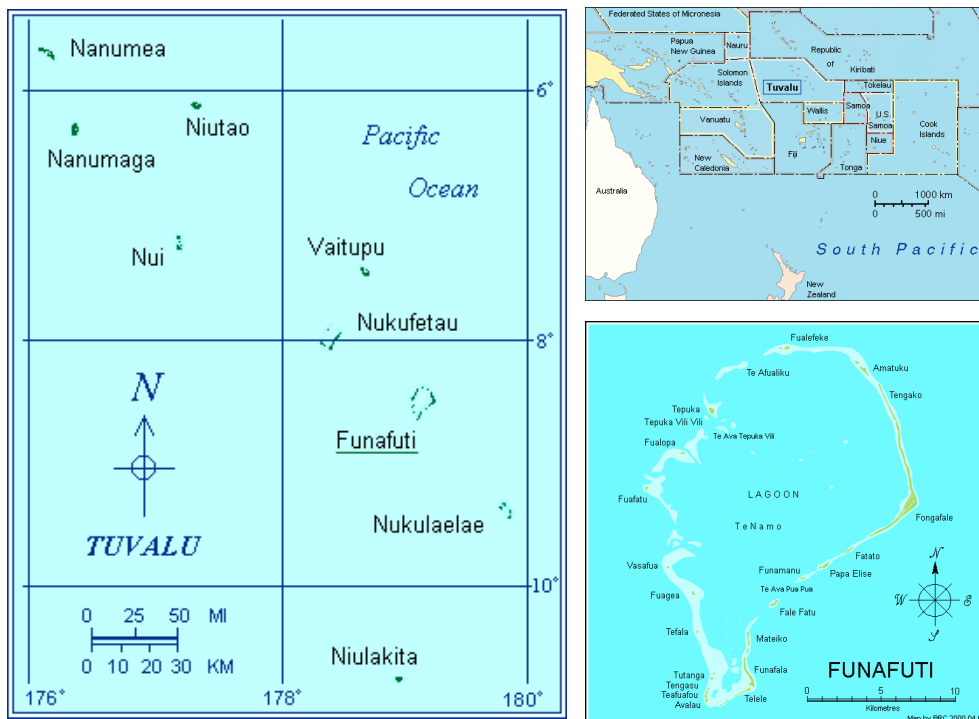
and other economically important species in the core zone, that could then serve as a source area from which “spillover” biomass could be exported beyond the core zone boundaries (Russ and Alcala, 1996a, 1996b; Roberts et al. 2001). This “excess” biomass would then be available for harvest by non-intensive fishing methods (eg, hook and line) within the surrounding buffer area.

### 3. Description of the Funafuti Conservation Area Project

#### 3.1 Background

Tuvalu is a small Pacific island nation with only 26 sq km of land area distributed among nine island groups that span a distance of about 680 km from Nanumea in the northwest (at 5°38’S, 176°07’E) to Niulakita in the southeast (at 10°45’S, 179°38’E) (map, Figure 2). In contrast to its small land area, Tuvalu’s territorial waters include a vast open-ocean area of 900,000 sq. km. The islands are mostly low-lying coral atolls with land elevation generally less than 3m above sea level (SPREP 1997), poor, thin soils, and no permanent freshwater aquifers. As a result of these conditions, agricultural activity is quite limited. Pelagic fisheries resources, while still fairly abundant, are not fully exploitable by Tuvalu, which lacks its own commercial-scale deep-water fishing fleet. With its small land mass, limited resource base, and remoteness, Tuvalu faces a number of daunting environmental and economic challenges. Among the most immediate needs are to develop viable options for safe potable water production due to the lack of surface water or groundwater; and establish suitable areas for disposal of solid and domestic wastes, especially in the population center of Fongafale. In addition, sea and air transportation are very limited, both inter-island and internationally, and will need to be expanded if the internal and external economy are to develop further. Added to these more immediate concerns, due to the very low elevation of its islands, the country faces the long-term threat of loss of land area and possibly, total inundation, should predictions of global warming eventuate.

Figure 2 Tuvalu Location Map



The total national population of Tuvalu is very small, with under 11,000 persons, and the population growth rate is declining overall. However, Fongafale, the main island of Funafuti atoll, and location of the seat of government and most economic activity in the country, is becoming increasingly urbanized and is under severe population pressure (Table 1). Due to limited employment opportunities on other islands, large numbers of outer island residents have migrated to Fongafale, which now has one of the highest population densities of any Pacific island (see Table 1). The increased population on this island poses threats to the existing natural resource base of Funafuti atoll, especially its fragile coastal ecosystems and fisheries resources (Knapman et al. 2002; Lane 1993; GOT 1992). It is believed that such threats exist due to direct increases in fishing pressure, and also due to environmental degradation associated with increasing pollution being discharged into the lagoon from the burgeoning population center on Fongafale.

**Table 1 Tuvalu Population Figures, 1973-2001**

<b>1. Population (total residents)</b>					
Year	Tuvalu		Fongafale (Funafuti)		
	number	density (persons/sq km)	number	percent of total	density (persons/sq km)
1973	5,887	229	871	14.8	312
1979	7,349	286	2,117	28.8	758
1991	9,043	353	3,843	42.5	1,377
2001 (est.)	10,276	401	4,518	44.0	1,619
<b>2. Growth Rate (per annum)</b>					
Period	Tuvalu		Fongafale (Funafuti)		
1979-1991	1.7		5.1		
1991-2001	1.3		1.6		

Sources: Central Statistics Division 1992; Fairbairn February 1993; and Knapman et al. 2002.

Against this backdrop of reported increases in fishing pressure, and the threat of deteriorating environmental quality, a recommendation was made in the ADB Fisheries Sector Study for Tuvalu (Berdach and Maynard 1994), for establishing marine sanctuaries in Tuvalu to ensure the continuing viability of marine resources for sustainable use in the future. At around the same time, the South Pacific Regional Environment Programme (SPREP), the United Nations Development Programme (UNDP), and the Global Environment Facility (GEF) initiated a regional South Pacific Biodiversity Conservation Programme (SPBCP). One of the core objectives of this program was to establish marine protected areas in some 14 nations in the Pacific region (SPREP May 1993). It was with the support of the SPBCP that the FCA project was begun in 1996.

By establishment of a marine protected area (MPA) as the main component of the conservation area, it was expected that trends of overexploitation of fisheries resources in Funafuti Lagoon could be reversed, with the MPA serving as a refuge where important food fish and shellfish species could grow and reproduce, so that biomass could be exported outside the CA boundaries for sustainable harvesting through traditional means in other parts of the lagoon. Under the SPBCP and related assistance, an estimated total of about A\$310,000 in technical

support services, equipment and facilities was provided over a six-year period (1996-2001), toward establishing the FCA.<sup>3</sup>

### 3.2 Objectives of the FCA

The FCA is the first marine protected area of its kind established in Tuvalu. As originally conceived, the stated **overall objective** of the FCA project was to conserve the terrestrial and marine biodiversity resources of Funafuti Atoll based on sustainable use principles, for the benefit of present and future generations. This includes the protection of valuable and productive habitats which contribute to the maintenance of biodiversity in the area; conservation of endangered species (such as turtles and giant clams); and improvement of the quality of fisheries resources. The **specific objectives** of the FCA project were to conduct a thorough public awareness campaign on marine, coral and atoll conservation, together with a continuous environmental conservation program; to develop institutions and strengthen local and community capacity to manage the conservation area; to develop a sustainable resource management plan to be implemented and monitored by village communities; and to develop sustainable income-generating activities for the Funafuti community and ensure sustainable financial support for conservation efforts.

### 3.3 Biophysical Characteristics of the FCA

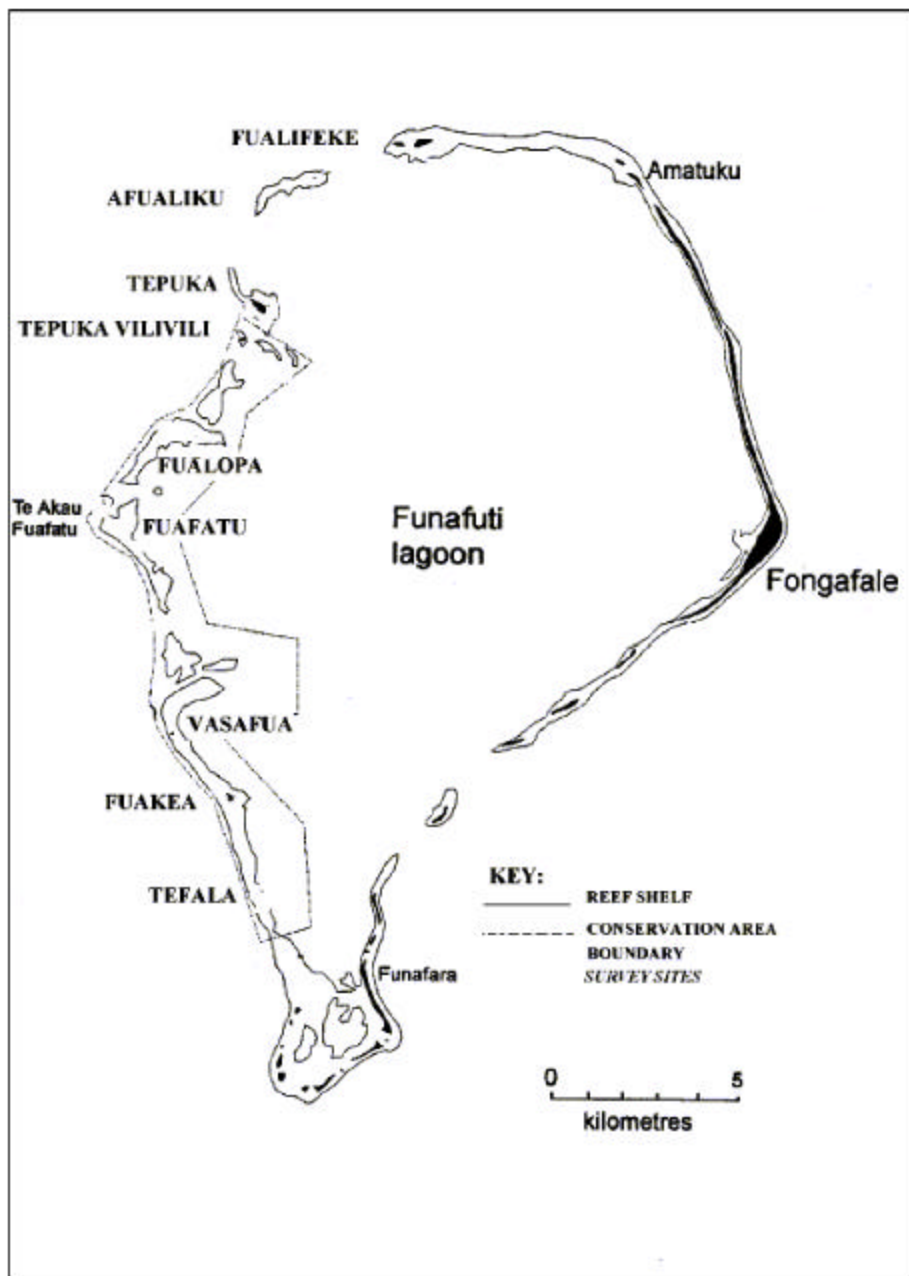
The FCA encompasses some 33 sq km of ocean area in the western portion of Funafuti Lagoon, including six small islets or *motu* that occupy a total land area of approximately 8 ha. The boundaries of the conservation area have been defined at a line 50m seaward from the ocean-side reef crest in the west, and to the 30m depth contour on the lagoon side in the east. In the north-south direction, the conservation area extends from just north of Tepuka Vilivili to just south of Tefala islets (Figure 3 and Figure 4).

The boundaries of the CA encompass about 20 percent of the total coral reef area of the lagoon. At least 400 species of fish (Kaly November 1997), and at least 36 species of corals (Sauni n.d.) are known from Funafuti Lagoon, with a large number of these reported within the CA. Despite their small land area, the islets of the CA are also significant for their biodiversity richness. About 40 percent of the total area of threatened native broadleaf forest of the atoll is found on the islets within the CA. Some 22 species of seabirds and shorebirds, and 2 species of land birds are recorded from the islets, and most of the bird species found here utilize the islets for nesting or roosting (Watling 1998). In addition, the indigenous coconut crab occurs here, and sea turtles are known to nest on the islet beaches (Funafuti Town Council [nd] Information Sheets No. 3 and 5). Most of these species have traditionally been exploited for food use by Tuvaluans.

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<sup>3</sup> An estimate (based mainly on information from the Funafuti Conservation Office) was made of the value of assistance reaching beneficiaries through the FCA project. This included approximately A\$20,000 annually (for six years) to cover operating costs; an estimated A\$100,000 in technical assistance for monitoring surveys and related training activities; A\$38,000 from NZODA for vessel; and A\$52,000 from Canada Fund for SCUBA equipment, another vessel and Interpretive Center building.

Figure 3 Funafuti Conservation Area





**Figure 4 Space Shuttle image of Funafuti Atoll and Lagoon, with approximate boundaries of the Conservation Area indicated**



Source: NASA

### **3.4 Project Initiation and Management Framework**

As part of the SPBCP, activities initiated by SPREP for the establishment of the FCA included significant community preparation. Community awareness-building was carried out by showing a series of informational videos to about 275 community members. This was reinforced through follow-up meetings, discussions, and workshops, as well as publicity through local radio and newspapers. Plans for an Interpretive Center were proposed, and funding was subsequently secured (from Canada Fund) to construct a building to house this facility.

Training activities were aimed primarily at increasing the capabilities of a group of core technical professionals to carry out the biological monitoring program. Trainees were government personnel drawn from the Environment and Fisheries departments, and working with the Funafuti Town Council, who had or were interested in obtaining SCUBA qualifications. Training consisted of instruction and certification in SCUBA, including dive safety, instruction in the use of global positioning system (GPS) equipment, and also instruction to help develop technical skills in survey methodologies, especially recognition and identification of a broad range of fish and

invertebrate taxa. Baseline and follow-up monitoring surveys were carried out in late 1997, and from late 1998 to early 1999, respectively. Following the termination of SPREP-funded activities, another monitoring survey was conducted in 2002, with support from the Global Coral Reef Monitoring Network project. A reference collection of corals, algae and invertebrates was started and deposited at the Town Council building.

The Funafuti Town Council is the executing agency for the conservation area, and it works in close collaboration with the traditional *falekaupule* (*maneapa*) system of elders or *toeaina*. Although the conservation area was initially declared under this traditional system, the CA is now afforded protection and formal legal status under the Tuvalu Conservation Area Act of 1998 (GOT 1998), and under by-laws enacted by the Funafuti Town Council (Funafuti Town Council 16 December 1999).

## 4. The Case Study

### 4.1 Background and Rationale of the Case Study

The purpose of the PRES project is to study environmental and natural resources management initiatives from around the Pacific region, in an effort to glean lessons that may be applied toward improving the effectiveness of such activities both locally and regionally. Also, in many cases, environmental objectives have not been effectively mainstreamed into overall national policy-making and economic planning. Thus one of the PRES objectives is to identify ways in which mainstreaming can be accomplished to better achieve important environmental and natural resources management goals.

As mentioned in the Introduction (Section 1, above), many in Tuvalu regard the FCA as a “highly successful” marine conservation project. However, little information about the project has reached beyond Tuvalu’s shores. Although the project is briefly noted in the *United Nations List of Protected Areas* (IUCN 1998), in another comprehensive global survey on the status of coral reefs, no mention is made of the marine protected area in Tuvalu (Maragos 1998).

This case study has been conducted to investigate and shed light on the current status of the FCA project in Tuvalu; to document lessons that may be learned from the project; and, based on the lessons, to make recommendations for more successful marine protected area management in the future. It is expected that the findings of the study will be helpful to the Government of Tuvalu when considering replication of this marine conservation and management model on other islands, and such findings may also provide insights into how effective mainstreaming will better support management activities. In addition, given the heavy reliance upon nearshore fisheries resources for subsistence and as a source of food protein in most Pacific island nations, and in other developing countries, this analysis should also prove relevant in a wider regional and global context.

### 4.2 Case Study Methodology

The case study was conducted over a period of approximately five weeks, with the Coastal Resources Management and Protected Areas Specialist having spent approximately three weeks on-site in Tuvalu.<sup>4</sup> The Specialist worked in close consultation with GOT counterparts, particularly within Foreign Affairs, the Conservation Office of the Funafuti Town Council, and the

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<sup>4</sup> The Specialist arrived in Tuvalu on 3 March 2003, and departed on 24 March 2003.

Fisheries Department. The main component activities and methodologies that were utilized are discussed below.

#### 4.2.1 Background Research

Information obtained through research based on secondary sources provided the initial foundation for the case study. Sources utilized included GOT statistics and relevant reports from the fisheries and environmental sectors. Core reference materials also included the reports describing the process of the establishment of the monitoring system for the FCA, and the implementation of the initial baseline and follow-up monitoring surveys. Research reports on other projects in marine conservation and protected area management from outside Tuvalu provided a basis for establishing a broader regional and global context. Key reference materials used for the study are listed in Annex A.

#### 4.2.2 Consultative Process

A range of consultative activities were carried out to supplement the findings from the background research. This information proved valuable for understanding the perceptions of the local community regarding the project. The consultative activities that were utilized were as follows:

- **informant interviews:** Interviews were conducted with key informants who have been involved in the process of establishing, monitoring, or managing the FCA. The informants shared their views about the accomplishments and successes that have been realized, as well as problems that have been encountered, during the start-up and implementation of the FCA project. A list of persons contacted is presented in Annex B.
- **round-table discussion:** A round-table discussion<sup>5</sup> was organized that drew together approximately 10 key stakeholders from the community representing a range of interests. The group included conservation managers, fishers, government representatives, and NGO participants. The open discussion format allowed a variety of views to be aired, and differing opinions to be expressed. Overall, a high degree of consensus was expressed regarding key issues. A report of the outputs of the round-table discussion is presented in Annex C.
- **questionnaires:** Questionnaires were prepared and distributed to various community stakeholders. This was done in two ways:
  - a set of questionnaires prepared for a target group of managers was distributed during the round-table discussion meeting, and completed and collected.
  - a second set of questionnaires, aimed at a general community target group, was prepared, and was administered with the assistance of personnel from the Conservation Office of the Funafuti Town Council and the Fisheries Department. This questionnaire was distributed to a representative sampling of respondents, including, among others, teachers, business people, school children, fishers, owners of property within the CA, and other residents of Funafuti.

A total of about 35 questionnaires were distributed to and completed by respondents in the two groups. The information obtained from the questionnaires gave a good indication of

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<sup>5</sup> Held on 11 March 2003.

overall knowledge and sentiment within the community about the FCA and general conservation issues. The two questionnaires, together with a tabulation and interpretation of responses, are presented in Annex D.

- **presentation of case study findings:** Toward the end of the on-site work in Tuvalu, the Specialist organized a wrap-up meeting during which the initial findings of the study were presented. In the round-table discussion that followed, members of the community, especially the managers and users of the FCA, had an opportunity to comment on the findings, to ensure greater accuracy and completeness of the information. The outputs of the wrap-up meeting are included in Annex C.

#### 4.2.3 Field Surveys

Direct observation of biophysical conditions in the FCA was accomplished through a series of field surveys. For the evaluation purposes of this case study, it was not intended to replicate the detailed quantitative monitoring surveys that had been conducted previously. Rather, “semi-quantitative” surveys<sup>6</sup> were made by means of SCUBA-diving and snorkeling at selected sites within the CA and at other sites outside the CA. This made it possible to obtain an overview of relative resource abundance, biodiversity, and ecosystem health, and to draw comparisons between prevailing conditions at CA and non-CA sites. The detailed findings of the field surveys are presented in Annex E.

## 5. Major Findings

### 5.1 Overall Evaluation of Performance of the FCA Project

Through meetings, interviews, and distribution of questionnaires, a great deal of data were gathered that reflect the knowledge and opinions of local conservation managers and the community at large with respect to: (i) marine ecology and conservation issues; (ii) the effects and benefits of the FCA project in protecting important fisheries resources and biodiversity; (iii) the capabilities of local institutions and personnel to carry out effective management of the FCA; (iv) the need for effective enforcement; (v) the need for community participation; and (vi) issues of financial sustainability. The responses to the questionnaires provide an overview of this state of knowledge, which is summarized in Table 2.

First-hand observations made during physical surveys conducted at various sites complement the information obtained through the consultative process. This corroboration was especially important in confirming the community’s observations concerning the status of fisheries and biodiversity resources within the conservation area.

Cumulatively, all the data gathered provide a comprehensive picture of the strengths and weaknesses of the FCA project, as implemented to-date. There was strong consensus, among both managers and community members at large, that the conservation area should be maintained as a no-take zone to protect valuable biodiversity and fisheries resources. The general findings support the conclusion that the FCA project has been relatively successful, while recognizing that the project has some weaknesses that will need to be overcome, if

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<sup>6</sup> The ‘semi-quantitative’ method included a mixture of qualitative and quantitative observations. For example, in some cases, estimates were made of the percentage of live coral coverage, and actual counts were made of numbers of individual fishes. However, in other situations, these data could not be gathered accurately, and in those cases, simple visual estimates were recorded.

continuing management of the FCA is to be effective and viable over the long term. A subjective rating of performance of various aspects of the project is presented in Table 3. Further discussion of these key elements or components follows in Section 5.2.

**Table 2 Summary of Findings Based on Questionnaire Responses**

Question/Issue (paraphrased from questionnaires)	No. of Responses			Percentage of Responses		
	Mgr (n=10)	Comm (n=25)	TOTAL (n=35)	% Mgr	% Comm	% TOTAL
<b>Biological Impacts/Benefits</b>						
Fish populations increasing as a result of the establishment of the FCA	8	17	25	80	68	72
Numbers of coconut crabs and birds increasing as a result of the establishment of the FCA	7	17	24	70	68	69
<b>Awareness</b>						
Awareness of importance of coral reefs was improved by FCA project	10	21	31	100	84	89
Continuing awareness-building is required	9			90		90
<b>Management Framework and Capacity</b>						
FCA is a good idea, the conservation area should be maintained	8	25	33	80	100	94
FCA should be community-managed	10	23	33	100	92	94
A traditional management system is best (vs. modern, scientific system)	2			20		20
Personnel need further training, and more people need to be trained, for management and enforcement of the FCA	8			80		80
<b>Participation</b>						
Volunteers should be encouraged to help with the management of the FCA	10			100		100
Respondents willing to volunteer to help with management of the FCA		14		0	56	56
Respondents interested to obtain more information about the FCA		10		0	40	40
<b>Enforcement</b>						
Violators of FCA regulations should be fined or jailed		11		0	44	44
Violators should receive training and then made to do community service for conservation		14		0	56	56
Violators should be treated with leniency		0		0	0	0
<b>Financial Sustainability</b>						
There is a clear need for further financial support for salaries, equipment and supplies, etc.	9			90		90
There is potential for the FCA to generate at least some of its own financial resources, eg through fees from ecotourism and recreation		22		0	88	88

Mgr=responses on Managers' Questionnaire (of total n=10 respondents); Comm=responses on Community Questionnaire (of total n=25 respondents).

**Table 3 Performance of the FCA Project: Strengths and Weaknesses, by Component**

Component or Element	Overall Performance Rating	Strengths	Weaknesses
1. Impacts of Conservation Efforts on Fisheries Resources and Biodiversity	●●●●	FCA appears to be functioning effectively as a sanctuary and breeding-ground for fishes; fishing pressure is limited, ensuring sustainable productivity of fish stocks	'Success' of the FCA may be due more to prevailing externalities rather than actual protection and management
2. Awareness-Building	●●●	Initially, efforts well-implemented and effective in increasing awareness	Awareness activities not sustained
3. Scientific Baseline and Monitoring	●●●	Technical staff trained; baseline for monitoring established, and follow-up monitoring conducted	Monitoring should include other parameters, should be structured to allow better time-series comparisons
4. Formalization / Institutionalization of Conservation Area	●●●	Conservation Area Act and FCA By-Laws enacted	No integrated management plan developed; Conservation Area Coordinating Committee formed but not active
5. Community Ownership and Participation	●●	Community voices their support in principle for the project	Community has not shown tangible support through direct participation in planning and management process; volunteerism lacking
6. Enforcement	●●	Conservation Office staff conducts regular patrols	Limited enforcement capacity; violations occurring; legal inconsistencies; violators not prosecuted
7. Economic and Financial Sustainability	●	Town Council has absorbed positions for two Conservation Officers	Lack of adequate financing for recurrent costs and capital expenditures threatens long-term success of the project
8. Mainstreaming	●	Conservation Area Act and FCA By-Laws enacted	Conservation initiatives within the FCA are not well integrated into local or national budget/policy plans; lack of adequate financing for recurrent costs and capital expenditures threatens long-term success of conservation efforts

Key: ●●●●● =excellent  
 ●●●● =very good  
 ●●● =good  
 ●● =fair  
 ● =poor

## 5.2 Performance of the FCA Project, by Component

The following subsections present an analysis of the strengths and weaknesses of the various elements of the FCA project, as implemented to-date. These elements are presented in sequence, starting with those judged to be most successful or effective, and progressing to those components that proved to be less effective.

### 5.2.1 Impacts of Conservation Efforts on Fisheries Resources and Biodiversity

Around 70 percent of those responding to the questionnaires indicated their strong belief that fish populations, as well as numbers of birds and coconut crabs, have increased as a result of the establishment of the conservation area in Funafuti lagoon. This opinion was also consistently expressed by most informants during interviews.

During the dive and snorkel surveys, high biomass and biodiversity were observed at two of the three sites visited within the CA (at Tefala and Fuafatu<sup>7</sup>). Also significant at these sites was the observation of large-sized individual fishes. Most of these fishes were highly-prized target food species, such as groupers and snappers. These fishes showed no wariness toward divers, were easily approached, and in fact sometimes actively approached divers, perhaps out of curiosity or in defense of territory. The presence of so many large fish that are choice target food species, and their uninhibited behavior, appear to indicate that there is very low fishing pressure at these sites. In addition, a large giant clam, transplanted by a conservation officer from outside the CA several years ago to Fuafatu, was seen to be still in place and was observed to have grown significantly since being placed within the FCA. While giant clams are highly prized for food in Tuvalu and actively targeted for harvesting, fishermen apparently have respected the CA regulations and have not harvested the transplanted giant clam from within the CA. Thus both direct and anecdotal observations indicate that the FCA is functioning as intended, as a 'no-take' zone where fishes and other organisms can safely breed and reproduce.

At the same time, however, other observations outside the CA make it more difficult to draw clear-cut conclusions concerning the effectiveness of conservation efforts within the FCA. During surveys at Tepuka and at South Fongafale (both located outside the CA), it was observed that coral growth is excellent, with live coral cover approaching 100 percent over much of the reef area at both sites. In addition, fish biomass and biodiversity at both sites is fairly high. The only parameter for which the FCA sites appeared to have an advantage over these non-FCA sites was fish size—on average, when comparing the same or similar species of fish, size distribution at the FCA sites (Tefala and Fuafatu) appeared to be higher than at the non-FCA sites surveyed (Tepuka and South Fongafale).

It could be reasoned that, if the conservation area was having a significant impact in effectively protecting fish and other fauna by restricting fishing pressure within its boundaries, then notable differences should be observable between fish populations in the FCA and non-FCA sites. However, this was not so clearly observed—some sites in the FCA were excellent and others degraded, while both of the sites outside the FCA that were surveyed were in excellent condition. Especially in the case of the South Fongafale site, it would be expected that fish populations might be vulnerable to higher fishing pressure resulting from the close proximity of fishermen from the main population center, and the quality of the reef might be degraded due to

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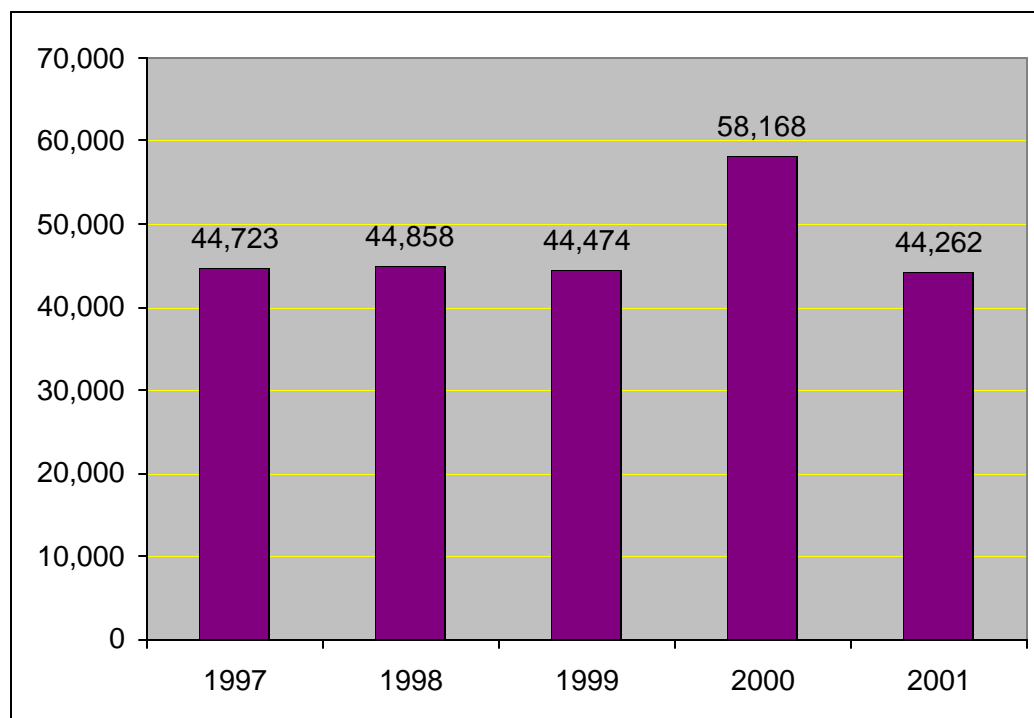
<sup>7</sup> At the third FCA site visited, Fualopa, the reef appeared to be in a more degraded condition, with fairly low biodiversity and biomass of fishes as well. This site is discussed further in Section 4.2.6, Enforcement.

impacts from runoff and pollutants entering the water in the vicinity of the reef. Neither of these effects was noted.

There are perhaps two plausible explanations for the apparent similarities observed in both FCA and non-FCA sites:

- it is possible that the FCA has become successfully established as a fish breeding-ground, and is already functioning in exporting 'spillover' biomass beyond the boundaries of the protected core zone into other parts of the lagoon (as discussed in Section 2, above). In such a circumstance the large populations of fishes observed elsewhere in the lagoon could in part be accounted for as a direct, beneficial outcome of protection of source stocks within the FCA.
- fishing pressure in Funafuti lagoon is less than has been asserted in the past (cf. Knapman et al 2002, Lane 1993, GOT 1992). While the human population in Funafuti continues to increase, fish catch has remained at a fairly constant level (Figure 5), and the fisheries resources are still relatively abundant. Possibly, the carrying capacity and maximum sustainable yield (MSY) for fisheries resources have not yet been reached. Also, the fact that commercial fishing activities are for the most part conducted in the open sea, outside the lagoon (lagoon fisheries is thus primarily subsistence or artisanal), may contribute to maintaining fishing pressure within the lagoon at sustainable levels. Thus, viable standing stocks of fish are still found in many areas of the lagoon.

**Figure 5 Annual Fish Production (kg), Funafuti Lagoon 1997-2001**



Source: NAFICOT (adapted from Knapman et al. 2002).



Due to certain weaknesses in the monitoring framework (these weaknesses are further discussed in Section 5.2.3), the impacts and benefits of the CA, with respect to changing condition of fish stocks, cannot be clearly demonstrated or fully evaluated at this time. Nonetheless, with proper continuing management, the CA can serve as a breeding ground that will help to maintain the ‘biological capital’ of genetic diversity present within the lagoon. This ‘capital’ can then produce ‘interest’—the excess biomass that is exported beyond the boundaries of the FCA—that can help to support sustainable fisheries production throughout the lagoon over the long term. Thus, the FCA provides an important mechanism to guard against the loss of biodiversity, that can function in either a remedial or preventive way, depending on the existing state of the resources.

### **5.2.2 Awareness-Building**

An intensive awareness-building campaign was part of the initial activities funded under the SPREP-supported FCA project. The campaign included presentation of a series of informational videos to about 275 community members. Follow-up meetings, discussions, and workshops were conducted, and information was disseminated through the local radio station and newspaper. A series of informational brochures, that explain a range of topics relating to marine conservation, were produced both in English and Tuvaluan language versions. Funding provided by the Canada Fund was used to construct a building to house an “Interpretive Center.” As conceived, the Center was intended to function as a focal point for continuing education and awareness-building activities within the community. The respondents to the questionnaires seemed to feel that their own awareness about marine conservation was improved significantly through these activities. However, respondents were ambivalent with respect to the effectiveness of the project in raising awareness within the general community—about half the respondents felt that people in the community are not aware of the project.

Awareness building activities were continued while the project provided funding. However, once the funding was terminated, awareness-building activities all but ceased. To date, the Interpretive Center building is empty and not being utilized. There is a definite consensus among people interviewed that awareness-building activities need to be continued and strengthened.

### **5.2.3 Scientific Baseline and Monitoring**

The project helped to create a basis for monitoring changes over time within the FCA by enabling technical staff of government, especially in the Fisheries Department and the Funafuti Town Council Conservation Office, to successfully conduct baseline surveys and two subsequent monitoring surveys. The monitoring surveys were at once a mechanism for obtaining information, and for fostering greater involvement and participation among government staff charged with the responsibility for conservation management functions. Case study interviewees and respondents to the questionnaires believe that there is still a need to continue training programs to further develop skills among technical staff, and also to train others to help shoulder the responsibilities for future monitoring of the CA.

While the data gathered for the baseline and monitoring surveys are exhaustive, the monitoring and survey protocols could be further improved. As designed, the monitoring program records mainly the diversity of species, and numbers of individual fishes observed at various sites. Obtaining estimates for other parameters, such as fish size distribution and biomass, can help to record shorter-term fluctuations in resource abundance. In fact, this shortcoming was recognized during the second monitoring survey (Kaly et al. April 1999). Also, establishment of permanent transect markers would make possible more accurate measurements, and thus make it easier to

draw more meaningful data comparisons over time. These recommendations for strengthening the monitoring program are discussed in greater detail in Section 8.1.1.

#### **5.2.4 Formalization / Institutionalization of the Conservation Area**

The main successes in institutionalizing and formalizing the establishment of the FCA came through the passage of the national Conservation Area Act of 1998 and of the Funafuti Town Council's by-laws dated 16 December 1999.. The national Act establishes a legal framework for declaring conservation areas nationwide, including possible future CA sites on the outer islands. The by-laws establish the regulations and procedures that govern the use of resources specifically within the FCA.

While these are significant steps toward institutionalizing the FCA, there are at the same time several institutional deficiencies that have resulted in some weaknesses in the management of the FCA. Most obvious of these is the lack of an integrated, community-based management plan for the FCA. It is not enough that the Act and by-laws specify the boundaries of the FCA, the permitted and prohibited uses within the FCA, and fines and punishments. There is an urgent need for a plan that presents a comprehensive vision for conservation and environmental improvement in Funafuti Lagoon as a whole. This recommendation had already been made in the first survey report for the FCA (Kaly, November 1997) but not acted upon. Further discussion of the details of developing such a plan are presented in Section 8.1.3.

#### **5.2.5 Community Ownership and Participation**

In the early stages of promoting the concept of a conservation area for Funafuti, considerable effort was made by consultants to engage community stakeholders and foster a sense of ownership of the project and stewardship for important fisheries resources. Participatory activities included the following:

- explanation of the importance of preserving the coral reef ecosystem, delivered to the community through videos and special presentations
- transfer of skills for management of the CA to selected community members, through intensive training programs
- establishment of a management hierarchy that attempted to place major management responsibility with the community, by working through the traditional 'council of elders' (falekaupule) and creating a coordinating body, the Conservation Area coordinating committee (CACC), to represent the interests of various community stakeholders.

The combination of a traditional management structure, with some modern management methods seems to have been readily accepted by the community. The concept of having a no-take area set aside for protection of fisheries resources is quite similar to a number of traditional Tuvaluan conservation practices. It was reported during interviews that, in the past, traditional restrictions were instituted by village elders based on understandings built up out of long-term experience of fluctuating fish stocks. It was also recognized by the traditional culture that restrictions on fishing, at certain times, for certain species, or in certain areas, would enable depleted fish stocks to recover.<sup>8</sup> More recently, village elders on the outer islands have utilized

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<sup>8</sup> The motivation for implementing certain restrictions may not have been entirely based on ecological considerations. Restrictions for harvesting certain preferred food species (eg, clams or turtles) may have been motivated in part

restrictions on certain types of gear (eg, banning use of nets in lagoons, while permitting pole-and-line fishing) as a management tool. Further comments by informants during interviews and group discussions indicated that, while the traditional practices were effective in the past, the 'modern' system introduced as part of the FCA project was more appropriate for management within Funafuti Lagoon under present-day conditions. It was felt that this system would provide a more effective management framework under the current conditions, for the following reasons:

- It is believed that, due to the growth of population in Fongafale, existing fishing pressures in the lagoon are too great to be effectively regulated through traditional restrictions. A modern system is potentially more effective in enforcing compliance.
- The "community" in Fongafale comprises people who come not only from Funafuti, but also from other outer island communities. Members of other island clans living in Funafuti may be reluctant to abide by a traditional system of restrictions imposed solely by the Funafuti elders. Thus the new system is viewed as being more equitable to all residents who live in Fongafale and utilizing the resources of the lagoon, regardless of their island of origin.
- The awareness-building activities undertaken as part of the FCA project improved understanding of conservation principles among fisherfolk, further reinforcing voluntary compliance with fishing restrictions in the FCA.

It was notable that, among the various interest groups interviewed, fishermen voiced the strongest support for establishing the conservation area as a no-take zone, even though they were the ones who were being directly instructed to limit their fishing activities. Possibly, this strong acceptance and understanding of the MPA management concept is based in part on familiarity with similar management practices that were used traditionally for generations.

While respondents and interviewees indicated that the planning of the FCA was carried out with the cooperation of the community, they also pointed out that greater community participation is needed to continue to manage the area effectively. In reality, the two FTC staff presently assigned as conservation officers are handling practically all responsibilities for the management of the area. Very little assistance is provided by others, whether from the Town Council or from the community at large. Volunteerism also needs to be encouraged, in order to contribute vital manpower to carry out various management, awareness-building, and enforcement functions.

In addition, the flow of authority and decision-making from the community to the conservation officers, who are the assigned implementors of the regulations and policies, has been institutionalized by the formation of a Conservation Area Coordinating Committee (CACC), a community-based advisory body that decides on policies and procedures affecting activities in the FCA. Unfortunately, the CACC, though formally established, is not active. No CACC meetings have been convened for approximately two years. Thus it is apparent that further institutional strengthening is required.

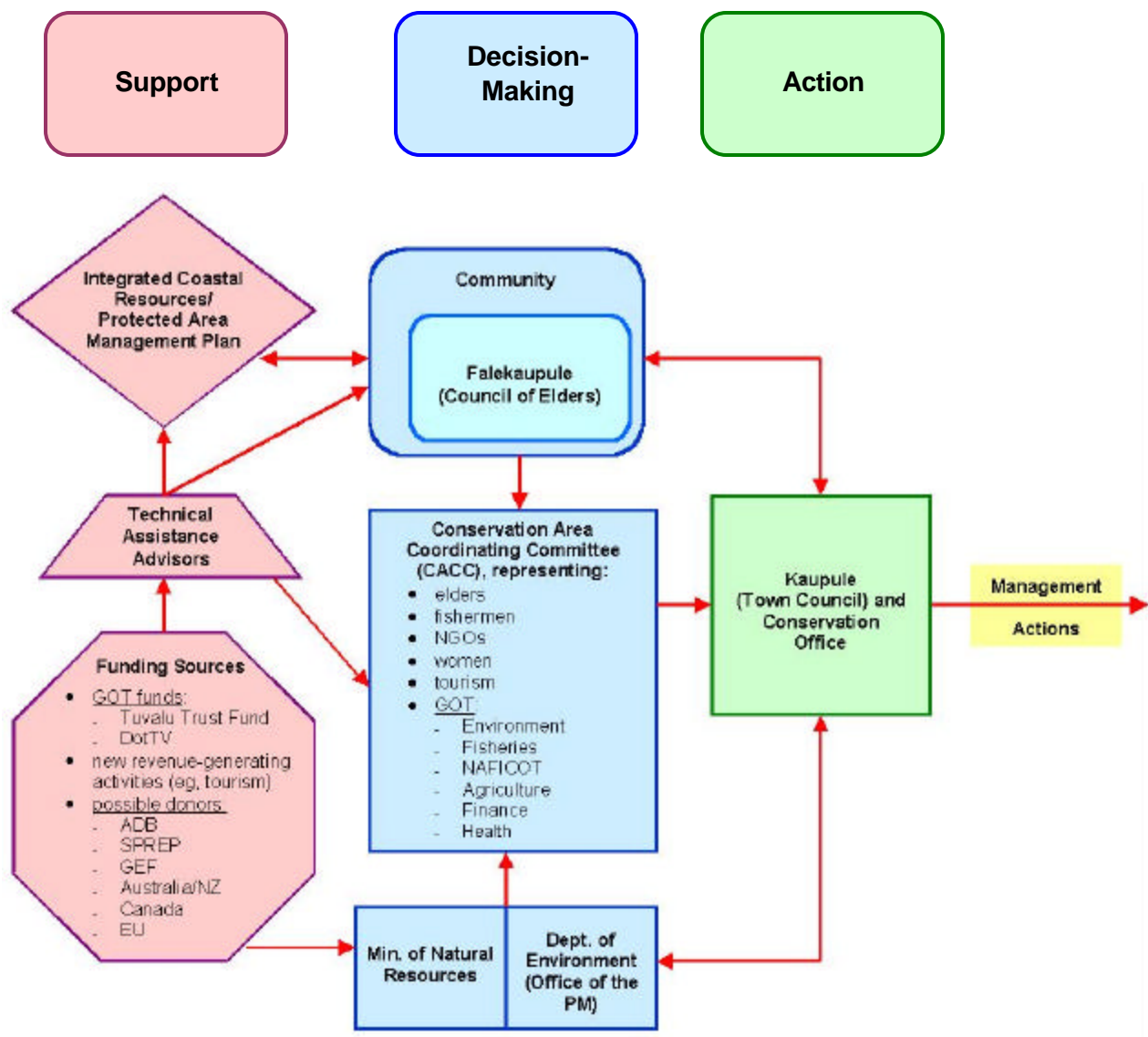
During consultative meetings for the case study, detailed discussions were devoted to strengthening the community-based structure for the flow of authority for management of the FCA. A schematic diagram illustrating this structure is presented in Figure 6.

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by a desire to reserve the use of these species for more privileged members of society, such as chiefs or elders. Nonetheless, restrictions for this purpose would still have the effect of reducing harvesting pressure on these species.

The diagram shows the management process, being guided by an integrated management plan, and being facilitated with the help of technical advisors. Funds from both internal and external sources may support management activities. Proposals regarding management originate with the community, as represented by the falekaupule. These are reviewed and approved by the CACC. Implementation is the responsibility of the conservation officers who work with the Town Council, and assistance may be provided by community members and the relevant government agencies.

Figure 6 FCA Management Schematic: Support System, Decision-Making, and Action



### 5.2.6 Enforcement

Based on anecdotal reports and direct observation of conditions within the FCA, there is strong evidence to suggest a high level of compliance with the regulations restricting fishing within the no-take area. At the same time, it is reported that enforcement efforts are weak. From these seemingly contradictory statements, it may be concluded that compliance is largely voluntary, being based on a sense of cooperation and stewardship among most community members.

Despite this finding, it is also reported that some violations of fishing regulations, including poaching within the FCA, are occurring, although at a relatively low frequency. Violations are reported to occur in those areas of the FCA that are more difficult to patrol, especially during the night.<sup>9</sup> At present, only one of the conservation officers, assisted occasionally by the second conservation officer, is engaged in regular patrolling. There is strong recognition that enforcement efforts are inadequate and need to be strengthened.

For the few violators who have been apprehended, only minimal fines have been imposed, despite provisions for stiff penalties in both the Conservation Area Act and the Funafuti Town Council By-Laws.<sup>10</sup> There are discrepancies in the level of punishment specified, between the Act and the By-Laws. Provisions in the Conservation Area Act call for a fine of A\$5,000 or imprisonment up to 28 months for each violation, while in the By-Laws, the level of punishment is set at A\$2,000 in fines or up to 12 months in prison.

More significantly, at present, there is no practical way that cases can be brought before the local judiciary. This is because the jurisdiction of the Resident Magistrate (the judge presiding over the Island Courts) is limited to those cases involving violations where the fines are set at or below A\$1,000. For other crimes wherein fines exceed A\$1,000, cases are heard by the Senior Magistrate of the High Court. The Senior Magistrate, based in Tonga, only visits Tuvalu once or twice a year, and gives priority to hearing cases involving more serious criminal matters. For these reasons, it is quite possible that cases involving violations within the FCA may still not be heard for many years.

Besides the problems with enforcing regulations against illegal fishing activities, it has also been reported that occasional 'permitted catches' have occurred within the FCA. One incident in particular is prominent—in late 2002, the Government put forward a special request to the falekaupule to open the FCA to fishing for two days, so that enough fish could be caught to provide for the immediate needs of feeding and entertaining a group of visiting dignitaries. While this request was granted by the falekaupule, in case study interviews and on questionnaires, most respondents indicated their strong opposition to such practices, and their feeling that making exceptions such as this is unfair to the community, and undermines the conservation

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<sup>9</sup> The area around Fualopa islet is reported to be one of the sites where illegal fishing is occurring. Informants explained that this area has traditionally been a favorite fishing ground. Part of the reason may be due to the fact that there is a deep channel close to the islet that permits easier navigation in these waters, than is possible around some of the other islets in the conservation area. Possibly as a result of continuing heavy fishing, the reef at Fualopa was seen to be quite degraded, and fish populations, diversity, and biomass were very low at this site as compared to the other sites surveyed.

<sup>10</sup> The Conservation Officer reports that to date, about 15 violators have been apprehended for illegal activities in the FCA, and, of these, only two have paid 'spot fines' of A\$100 each. Thus far, none of the cases have gone to trial.

effort. The community appears to be strongly in favor of maintaining the FCA as a strict no-take zone.

### 5.2.7 Economic and Financial Sustainability

The findings of this case study highlight the fact that, in implementing the FCA project, not enough attention was paid to developing sources for sustainable, long-term financing of conservation efforts. Only a small part of project funds were committed to this critical element, (see Item D., "Income Generation Projects," in Table 4 and Table 5), and no practical mechanisms for sustainable financing were put into place. As a result, conservation efforts were cut back severely once project funding from SPREP ceased (in 2001). This caused a feeling of frustration and disillusionment among key stakeholders once the project funding was terminated.

**Table 4 SPREP Annual Expenditures for the FCA Project, Years 1-3**

Component	Costs, US\$			
	Year 1	Year 2	Year 3	TOTAL
A. Project Management	\$99,053	\$69,119	\$59,264	\$227,435
B. Environmental Education	\$10,257	\$3,840	\$2,599	\$16,695
C. Resource Management Plan	\$51,327	\$2,555	\$2,555	\$56,437
D. Income Generation Projects	\$12,915	\$1,869	\$1,139	\$15,923
<b>Total Project Costs</b>	<b>\$173,552</b>	<b>\$77,382</b>	<b>\$65,556</b>	<b>\$316,490</b>

Source: SPREP. Amounts converted from Australian dollars to US dollars (US\$1.00=A\$1.3699)

**Table 5 SPREP Expenditures for the FCA Project, by Funding Source**

COMPONENT	Contributions by Funding Source, US\$				TOTALS
	SPBCP	GOT	FTC	OTHERS	
<b>A. Project Management</b>					
Investment	\$58,349	\$0	\$0	\$0	\$58,349
Recurrent	\$88,757	\$0	\$55,144	\$25,185	\$169,086
<b>B. Environmental Education</b>					
Investment	\$9,855	\$0	\$1,314	\$0	\$11,169
Recurrent	\$3,249	\$0	\$2,278	\$0	\$5,526
<b>C. Management Plan</b>					
Investment	\$39,355	\$2,154	\$0	\$0	\$41,509
Recurrent	\$8,359	\$6,570	\$0	\$0	\$14,929
<b>D. Income Generation Projects</b>					
Investment	\$13,119	\$0	\$0	\$0	\$13,119
Recurrent	\$0	\$0	\$2,803	\$0	\$2,803
<b>USD (rounded)</b>	<b>\$221,042</b>	<b>\$8,724</b>	<b>\$61,539</b>	<b>\$25,185</b>	<b>\$316,490</b>

Source: SPREP. Amounts converted from Australian dollars to US dollars (USD\$1.00=A\$1.3699)

SPBCP=South Pacific Biodiversity Conservation Programme; GOT=Government of Tuvalu; FTC=Funafuti Town Council.

To its credit, the Funafuti Town Council has managed to absorb two staff positions for Conservation Officers since then. The expenditures by the Town Council to support the

Conservation Office, and the revenues received for the conservation area, are summarized in Table 6.

**Table 6 Revenues and Expenditures of the Funafuti Town Council for Management of the FCA**

Revenue / Expenditure Items (A\$)	Year	
	2001	2002
<b>Revenues</b>		
Total Revenues Collected for Conservation Area (user fees, boat hire, fines from violators, etc.)	<b>\$4,446</b>	<b>\$10,149</b>
<b>Expenditures</b>		
Conservation Officer Salaries (estimate, for 2 positions)	<b>\$15,000</b>	<b>\$15,000</b>
Total Misc. Expenditures (eg, fuel, printing, maintenance, etc.)	<b>\$2,677</b>	<b>\$5,793</b>
Total Expenditures for Conservation Area	<b>\$17,677</b>	<b>\$20,793</b>
<b>Net Surplus (Deficit)</b>	<b>(\$13,231)</b>	<b>(\$10,644)</b>

Source: Funafuti Town Council, Conservation Office.

As shown, funds allocated by the FTC for the purpose of managing the FCA have been quite limited, and additional funds are needed to support essential recurrent operations such as patrolling, repair and maintenance of equipment, periodic biological monitoring, and continuing awareness-building activities. For implementation to be most effective, other capital expenditures can also be anticipated, eg, for acquisition of additional vessels, purchase of new diving equipment, installation of boundary markers and signage, and furnishing and equipping of the Interpretive Center, among others. Regular in-kind contributions from the community (eg, through volunteer labor, as mentioned in Section 5.2.5, above) would help to reduce the funding burden and thus contribute to long-term viability.

During the course of the case study, stakeholders identified the most likely sources of potential funding to support conservation activities, as follows:

- grants or loans from development institutions (eg, bilateral finding institutions, SPREP, ADB, GEF, etc.)
- allocations from a regional 'Conservation Trust Fund'
- dedicated allotments for conservation from the Tuvalu Trust Fund
- regular budget allotments in support of the FCA from the national annual budget
- regular budget allotments in support of the FCA from the Funafuti Town Council annual budget
- taxes assessed on revenues that accrue as a result of visitor activities in the FCA (ecotourism, research, recreational and educational uses)
- fees directly collected for visitor use of the FCA
- fees collected for uses outside the FCA, but which are based on benefits related to effective management of the FCA (eg, fees for fishing or scuba-diving in other areas of Funafuti Lagoon, that benefit by increased populations of fish generated from the FCA)
- fines collected for violations occurring in the FCA

Recommendations for exploring a number of these funding options are more fully discussed in Section 8.1.6.

Most funding that might come from external sources is usually time-bound, and thus inherently less sustainable (eg, as observed in the case of SPREP funding for the FCA) than other funds that might be internally generated on a continuous basis. Since internal funding mechanisms are considered to be more stable over the long term than funds coming from outside sources, all possibilities to further develop sustainable revenue-generating activities relating to the use of the FCA should be fully investigated.

### **5.2.8 Mainstreaming**

The potential for mainstreaming conservation efforts in Funafuti Lagoon has thus far not been realized. Mainstreaming implies that Government will embrace the important environmental and conservation objectives of the FCA initiative as an integral part of its overall national economic and development policy framework. That this has not occurred is evidenced by the fact that many core activities relating to the proper functioning of the FCA have come to a near standstill following the withdrawal of external support.

For conservation efforts to be sustainable, it is essential that government policy-makers understand fully the significance of the resources being protected within the FCA (and the importance of other resources that might be protected in the future by establishing similar MPAs at other locations around the country). The FCA is intended to safeguard vital biodiversity and fisheries breeding stocks that have the potential to produce nutritional protein for Tuvalu's citizens on a sustainable basis. In addition, coral reefs in the FCA form a physical barrier that protects the low-lying atoll islets from inundation and erosion due to storm waves. Also, the biodiversity resources of the reefs have the potential to support a variety of economic activities (still to be developed), including ecotourism, mariculture, and bioprospecting. For these reasons, the resources being protected within the FCA (and similar resources in other locations around the country) are of national significance, and efforts aimed at their conservation should be fully integrated into national economic and policy planning.

Economic valuation of the resources of the FCA can provide a yardstick that will enable policy-makers to better appreciate the significance of the resources. Further information about the economic valuation of these vital marine resources is provided in Section 7, while additional mechanisms for linking MPA management with other government initiatives are discussed in Section 8.3.1.

## **6. Lessons Learned**

### **6.1 General Lessons Learned From Marine Protected Areas**

Many valuable lessons have emerged over the years since MPA projects were first started, that can be applied toward the successful establishment and management of new MPAs in other areas. The key lessons to emerge from extensive review and evaluation of numerous marine conservation projects over the years are that:

- MPAs should be established according to a well-articulated process that includes community participation and fosters a sense of local responsibility or 'ownership'
- there should be close collaboration between community members and local government



- multiple local stakeholders, representing a wide range of interest groups, as well as higher-level government and donor agencies, should all be involved in planning and management—such an integrated planning process is essential in helping to reconcile the divergent interests of all the various stakeholders
- plans based on reliable information (eg, environmental profiles and baseline data) are more likely to succeed; baseline information, generated with assistance of academic institutions and using participatory coastal resource assessment, is a prerequisite for management planning and to enable comparative analyses of “with project” and “without project” scenarios for present and future learning
- financial mechanisms (incentives and disincentives, revenue-generating activities) should be utilized in creative ways to support management and conservation efforts, so that these become self-supporting and sustainable over the long term
- management of MPAs should be broadly integrated, both ecologically and socio-economically, in order to achieve the greatest benefits
- active participation of community members engenders learning and the basic level of awareness and commitment that is a prerequisite to ensure long-term sustainability of MPA management.

While most conservationists, scientists, and resource managers would agree that the MPA concept is sound in theory, in practice many MPAs established in a wide variety of biophysical, socioeconomic, and cultural settings have shown only limited effectiveness in reversing the trends of resource depletion. Turning again to the Philippines (which arguably has the most extensive experience in MPA management of any tropical island nation), it has been observed that for some 439 recorded MPAs, only 44 are being effectively managed, ie, showing full enforcement of regulations (Pajaro et al. 1999). Thus the overall level of effectiveness of management within MPAs in the Philippines is estimated at only 10 to 25 percent, with the lower figure probably being more accurate (Schuettensberg nd). A similar situation is also reported from Indonesia, where, of some 106 proposed or legislated marine parks and protected areas, only thirteen had some form of management, and an even lesser number were considered as “properly protected and managed” (White et al. 1998). These observations suggest that there is still considerable room for improvement, and further lessons can still be learned, especially from other, relatively successful models, to guide more effective implementation and management of MPAs. It is believed that the FCA project may serve as one such model, and provide useful lessons for marine conservation initiatives being attempted elsewhere around the Pacific.

## **6.2 Lessons from The Funafuti Conservation Area**

In many respects, the lessons gathered during this case study of the FCA mirror quite closely the general lessons learned from experiences in managing MPAs elsewhere. The lessons gathered from the Funafuti experience are briefly discussed below:

- The establishment of a MPA can yield tangible benefits in terms of improved community awareness, increased fish biomass, and sustained viability of biodiversity resources. The MPA set up in Funafuti lagoon demonstrates these benefits.

- The utility of traditional management systems depends on community acceptance, and these systems may not be appropriate in all situations. Traditional fisheries management systems have been utilized in Tuvalu for centuries. However, interviewees recognized that purely traditional systems may not be applicable in cases where significant societal change has occurred. Such is the case on Funafuti atoll. Due largely to the influx of immigrants from outer island communities, the composition of the community in Funafuti's main population center of Fongafale is now a mixture of clans from various islands. Traditional management, based on procedures dictated by a council of elders, and enforced largely through peer pressure, works well within smaller, homogeneous community groups. In more heterogeneous and populous communities, a more 'modern' system for management, such as the one initiated under the FCA project, which depends more on a formal legal framework for establishing regulations and sanctions based on scientific information, may be more effective than the traditional system. It should be noted that traditional systems may still be relevant for Tuvalu's outer island communities, and elements of traditional management may be incorporated into any management system, as long as these concepts are supported by the community as a whole.
- The establishment of a marine protected area needs to be carried out as part of an overall program of management for an integrated ecosystem, not in isolation. This has not yet been done in Funafuti Lagoon. The FCA is in fact only one element of a typical MPA—it is the core 'no-take' zone, but no buffer zone has been delineated. A community-based, integrated coastal management program for the Funafuti Lagoon ecosystem is urgently needed to define permitted uses and a management framework for the entire lagoon and atoll.
- Selecting an area that is not under intensive pressure, either from heavy fishing activity or due to serious environmental impacts (eg, from such influences as pollution or land transformation), increases the chances of successfully maintaining healthy marine biodiversity resources and breeding stocks for fisheries within an MPA. In such cases, the MPA mainly serves a preventive, rather than a remedial function (ie, preserving existing stocks, rather than restoring depleted resources). Proper management under these conditions can help to protect biodiversity for future generations, and maintain areas of outstanding biological quality, which can then be utilized for ecotourism, research and educational purposes, and other non-extractive uses.
- It is critical that realistic sources for sustainable financing be identified and developed to support management and conservation efforts, if an MPA is to be viable over the long-term. Failure to establish a framework for financial sustainability can seriously undermine the conservation initiative. This is the most pervasive problem affecting management and long-term viability of the FCA.

## 7. Costs and Expected Benefits of Management

In order to ascertain the value of maintaining the FCA in real terms, it is necessary to make reasonable estimates of existing or projected costs and benefits. A rough calculation is presented here. A starting-point for cost projections can be found in the current budgetary expenditures committed to the management of the CA. Counting salaries for the two conservation officers, and incidental expenses, it is estimated that the Funafuti Town Council is committing roughly A\$20,000 annually to support management of the conservation area (based on information from the FTC Conservation Office). As mentioned in the earlier discussion, this level of commitment is inadequate to properly sustain the conservation initiative. In order to bring

support up to the level needed for more effective implementation, additional funds must be committed for other recurrent and capital expenditures. Rough estimates for these expenditures are summarized in Table 7 and expressed on an annualized basis. Projected costs for more effective management of the FCA on a sustainable basis are estimated at around A\$71,000/yr for an initial five-year period. Presumably, total annual costs would drop after this initial five-year period, since it would not be necessary to replace many of the capital expenditure items every five years.

**Table 7 Estimated Budgetary Requirements for the FCA, 5 Year Operations**

	Y1	Y2	Y3	Y4	Y5	5-YR TOTAL	ANNUALIZED
<b>RECURRENT COSTS</b>							
salaries, 4 conservation officers	\$25,000	\$28,000	\$30,000	\$32,000	\$35,000	\$150,000	\$30,000
training	\$1,200	\$1,500	\$1,500	\$1,500	\$8,000	\$13,700	\$2,740
fuel	\$5,000	\$6,000	\$8,000	\$8,500	\$9,000	\$36,500	\$7,300
equipment repair and maintenance	\$3,000	\$3,500	\$3,500	\$5,000	\$6,000	\$21,000	\$4,200
miscellaneous supplies	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$5,000	\$1,000
printing, educational materials	\$500	\$1,000	\$2,000	\$1,000	\$500	\$5,000	\$1,000
<b>Subtotal, Recurrent Costs</b>						<b>\$231,200</b>	<b>\$46,240</b>
<b>CAPITAL COSTS</b>							
additional boat			\$45,000			\$45,000	\$9,000
additional compressor		\$4,000				\$4,000	\$800
diving equipment		\$3,000				\$3,000	\$600
safety equipment		\$2,000				\$2,000	\$400
signage and boundary marker supplies	\$5,000					\$5,000	\$1,000
biological monitoring/survey supplies	\$1,000					\$1,000	\$200
GPS units (2)	\$500					\$500	\$100
furnishings, Interpretive Center	\$3,000	\$5,000				\$8,000	\$1,600
computer and peripherals, Interpretive Center	\$5,000					\$5,000	\$1,000
seawater circulating pump			\$1,000			\$1,000	\$200
aquarium			\$200			\$200	\$40
miscellaneous and contingency	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$50,000	\$10,000
<b>Subtotal, Capital Costs</b>						<b>\$124,700</b>	<b>\$24,940</b>
<b>TOTAL PROJECT COSTS</b>						<b>\$355,900</b>	<b>\$71,180</b>

Over the past decade, considerable analysis has been done to establish economic valuations for various natural resources systems and ecosystems, including coral reefs. It has been estimated that typical coral reefs in the Philippines produce benefits (annual net revenues) ranging from US\$29,400 to US\$113,000 per sq km per year, or approximately A\$43,500 to A\$167,200 per sq km per year. (White et al. 2000). This calculation takes into account the varied biophysical,

socio-cultural, and economic functions, or 'services,' performed by coral reefs, including serving as a source of genetic biodiversity; providing a physical barrier to preserve valuable coastline and attenuate the destructive impacts of storm waves; harboring breeding stocks of important species of fish, shellfish, and other species used for food and other purposes; providing an environment that can support ecotourism, ocean recreation, and other economic activities; and providing for other possible future benefits as a result of new discoveries through scientific research, 'bio-prospecting,' and similar activities.

Taking this figure as a starting-point, it can be estimated that within the 33 sq km area of the FCA, perhaps 30 percent of the total area, or some 10 sq km, are covered by coral reefs. Since biodiversity values in the Philippines would be expected to be inherently higher than in Tuvalu (because the Philippines is at the 'epi-center' of global marine biological diversity, while Tuvalu lies outside this richest zone), it would be appropriate to reduce the valuation figure for Tuvalu's coral reefs, say, by about 25 percent.<sup>11</sup> An estimated value of Tuvalu's coral reefs can thus be calculated as follows:

A\$105,380/sq km/yr (median economic value [annual net revenues] of coral reefs in Philippines)  
- 25%, = A\$79,040/sq km/yr (adjusted estimated economic value of Tuvalu coral reefs)  
x 10 sq km in the FCA  
= A\$790,400/yr of potential annual economic benefits for coral reefs in the FCA.

Assume that effective management of the FCA results in a 30 percent increase in the reef's total productivity over a five-year period:

A\$790,400/yr x 5 yr = \$3,952,000 net revenues for 5 years  
  
x 30% = A\$1,185,600 gross productivity increase for five years or, on an annualized basis,  
  
) 5 = A\$237,120 per year.

Subtracting the annualized costs calculated earlier,

- A\$71,000/yr management costs

yields the net economic returns from improved management of coral reefs within the FCA,

= A\$163,120/yr net economic benefit to be realized through more effective management of the FCA.

Based on this rough calculation, it is evident that significant benefits can accrue to the community and the nation through the continued operation of the FCA. It should be noted, also, that these calculations do not include the added benefits that are realized as a result of conserving other non-marine resources within the FCA, such as bird life and terrestrial flora. The overall benefits to the nation and the community can be further increased by improving the

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<sup>11</sup> This adjustment is considered conservative. It could also be argued that other functions of reefs have greater value for Tuvalu than for the Philippines. For example, the functioning of reefs to protect against loss of shoreline is highly significant in Tuvalu, given the low elevation of land masses, but less so in the Philippines. However, for the sake of making a conservative estimate, the net downward adjustment indicated is being used.

effectiveness and efficiency of management of the FCA, and also by increasing the total area under management, possibly both within Funafuti lagoon, and on the outer island atolls as well.

## 8. Recommendations

This section presents a series of recommendations for applying the lessons learned, both from experiences of managing MPAs elsewhere, and from the specific experience of management within the FCA. These recommendations can be applied for improving the FCA project itself; for replication at other locations within Tuvalu; and for use in furthering marine conservation objectives in other countries within the region, and beyond.

### 8.1 Strengthening the FCA Project

#### 8.1.1 Improving the Monitoring Methodology

The monitoring program that was initiated with SPREP support achieved some important targets, and helped to more clearly characterize the biological and fisheries resources of the FCA. However, a number of aspects of the monitoring methodology could be improved, in order to gather more useful data to help determine changes over time in the condition of living resources within the FCA and other parts of Funafuti lagoon. This information could then be used, for example, to analyze whether or not the FCA was contributing to the export of 'excess biomass' and thus helping to support higher levels of sustainable fishing throughout the rest of the lagoon. The following key recommendations are offered for improving the effectiveness of monitoring within the FCA:

- **Set up permanent stations (transects or quadrats) for long-term monitoring.** Under the FCA project, transect sites were identified by use of GPS, and were then relocated, again using GPS, for subsequent monitoring actions. However, the degree of accuracy in pinpointing the exact site of prior monitoring surveys is less than could be achieved through the use of permanent stations. By using permanent transects or quadrats, it would be possible to follow the growth of specific coral colonies and other sessile organisms over time. Combining permanent transects or quadrats with photographic or video documentation, would further improve the utility of the data, and would have the added advantage that information captured through these media could be used for public education and awareness-building purposes.
- As part of the monitoring protocol, **include parameters to measure fish biomass and size distribution.** While differences in fish size and biomass have been noted at different sites, the observations are mainly qualitative, and no quantitative comparisons for these indicators have yet been made, either among different sites or over time at the same site. In well-managed protected areas, these parameters may change dramatically over relatively short time periods, and may provide definitive evidence of reduced fishing pressure and of establishment of breeding populations of fishes.
- **Include other control sites** among the sites being monitored, to obtain a more comprehensive picture of conditions throughout the lagoon. For example, the site at South Fongafale that was informally surveyed for the case study, could be included for future monitoring activities. This site is especially significant, since it is believed that it is one of the areas in the lagoon that is most vulnerable, due to its close proximity to the main population

center, both to fishing pressure and to possible impacts from environmental effects such as pollution.

### 8.1.2 Strengthening Public Awareness

Awareness-building is a core activity that must be included for effective and successful management of any MPA. Many opportunities exist for strengthening the conservation awareness of the public in Funafuti. Among the most important steps to be taken in this regard are the following:

- **Operationalize the Interpretive Center.** A new building has been constructed to house an interpretive center for marine conservation, but has stood vacant since it was erected. The building is well situated, being located directly behind the main school in the middle of the town center in Fongafale, and directly fronting the lagoon. Thus it is easily accessible for schoolchildren, and at the same time, being located on the shore, it provides ready access to the marine and coastal environment. Funds are needed to equip, furnish, and staff the Interpretive Center. Among the priority items needed to properly provision the center are:
  - directional and informational signage to identify the location of the Interpretive Center from the main road
  - desk, tables and chairs
  - display cabinets
  - circulating seawater system and aquarium
  - computer
  - library and reference materials, teaching aids
  - basic laboratory equipment
  - exhibit materials

Other optional equipment which could be acquired after the Center is operational might include slide projector, videotape machine and monitor, and digital camera.

One part-time staff person should be assigned from the Conservation Office to serve as an Interpretive Specialist for the Center. Regular hours of operation (say, 2-3 hours per day, 5 or 6 days per week) should be established and the Interpretive Specialist should be present during these hours.

The Interpretive Center offers tremendous potential to serve as a focal point and gathering-place for members of the community and visitors to Tuvalu to learn more about the FCA and the marine environment in general. Many activities and special events designed to improve public awareness and foster community participation could be organized through the Center. Visitors' donations, and participants' fees for special events, could help to defray some of the operating costs.

- **Incorporate conservation lessons into the school curriculum.** Materials could be developed to teach students important basic lessons about marine biology and the need to conserve vital marine resources. This should be done both at the primary and secondary school level. Such school programs will have the greatest relevance and impact if the content is as site-specific as possible (eg, students in Fongafale should study about the Funafuti Lagoon and its biological resources). Such programs should also feature field outings to give students first-hand experience in interacting with the natural environment.

Field trips to the FCA could be coordinated with the Conservation Office. Students could also participate in environmental improvement or research activities (eg, beach clean-up, reef and fish monitoring, bird census), as part of the field study.

- **Link conservation lessons to traditional ecological knowledge and wisdom (TEKW) as practiced in Tuvalu.** By drawing comparisons and contrasts between modern conservation concepts and traditional Tuvaluan practices, beneficiaries will more readily come to understand the need for ongoing marine conservation activities. The target community will be able to relate the need for conservation to their own personal experiences, and will be able to draw the best elements from different management systems when providing input into local management planning.
- **Mobilize the community** to assume greater responsibility for managing their own resources. Many opportunities exist for developing organized community-based marine conservation and management programs in Tuvalu. Different groups within the community, eg, businesses, church and school groups, and NGOs, among others, could become involved and assume responsibility for carrying out basic environmental improvement and awareness-building activities at different geographic sites, through such vehicles as 'Adopt-a-Reef', 'Adopt-an-Islet', or 'Adopt-a-Beach' programs. As part of an integrated community-based management program, community members should also become involved with the overall resource management planning process. Community-based resource mapping is one activity that can help to stimulate direct community participation in the management process. Participation in programs such as ReefCheck,<sup>12</sup> an internationally-recognized program for community-based monitoring of coral reefs, can also generate enthusiasm and help to promote long-term commitment among community members for self-management of resources.

### 8.1.3 Development of an Integrated Management Plan

The lack of a management plan treating the entire Funafuti lagoon as an integrated ecosystem, and addressing a wide range of interconnected land, water, and natural resources management issues, is a shortcoming that makes effective management difficult. The following steps are recommended in order to develop such a plan:

- **Initiate an integrated, community-based, participatory planning process.** The existing CACC, although presently inactive, has already been set up as a body representing the interests of various stakeholders within the community, and could be revitalized to take the lead in developing a management plan. Efforts should be made to convene regular meetings of the CACC that should be open to all interested individuals to attend. At least initially, the activities of the CACC will need to be facilitated by an experienced community development specialist and a coastal resources management or protected areas specialist. The matters to be discussed and decided upon at the meetings should include:
  - area of coverage: broadening of the definition of the FCA to include the entire lagoon, and establishing zones in addition to the conservation area, for other uses
  - exploration of mechanisms to mobilize the community: establishing/strengthening of NGOs, awareness-building activities, training programs, etc.
  - exploring possible financing mechanisms.

<sup>12</sup> More information about the ReefCheck program is available at their website: [www.reefcheck.org](http://www.reefcheck.org).

- **Integrate the management of the FCA into an overall management plan for the larger lagoon and atoll area.** Ideally, such a management plan should be prepared with the full participation of the community, and should reflect the views of a broad range of stakeholders. Such processes as participatory community mapping activities, and input from the CACC can help to develop a plan that fulfills the requirements for conservation, and accurately reflects the community's desires and priorities. The plan should encompass responses to the varied natural and manmade processes that are occurring in the larger lagoon and atoll ecosystem as a whole (eg, pollution, impacts of global warming, human settlement, water utilization, fishing practices throughout the lagoon, tourism development, etc.).
- **Validate the plan.** Once formulated, the plan should be formally adopted by the community. This may be accomplished through resolutions of the Funafuti Town Council, and revisions to the by-laws for the FCA, if required.

#### 8.1.4 Improving Enforcement

With technical support from SPREP, considerable progress was made in establishing a legal framework for the FCA, through the passage of the Conservation Area Act and the relevant by-laws of the Funafuti Town Council. Less attention was paid, however, to determining how these regulations would actually be enforced and implemented. As a result, enforcement is presently one of the weakest areas in the management of the FCA. Several steps are recommended to strengthen enforcement capabilities:

- **Survey, delineate, and mark CA boundaries.** Fishermen have mentioned that it would be helpful if the boundaries of the FCA were clearly marked so that they could be certain of the limits of the permitted fishing area.<sup>13</sup> This would require that the boundaries first be surveyed and correctly located. The Lands and Survey Division has the necessary capabilities to assist with this task. Once the survey is completed, markers would need to be installed. The buoys to be used as markers should be designed and selected to be affordable, clearly visible, durable, and tamper-resistant. Anchoring devices should be strong enough to remain in place even under strong storm conditions. A number of the marker buoys in the most strategic locations could also have attached informational bilingual signage that explains the regulations within the no-take area.
- **Establish a community-based patrol force.** At present, the manpower available for patrolling and other enforcement activities within the FCA is very limited. One of the conservation officers, with occasional assistance from the second conservation officer, conducts regular patrols, but violators poaching within the waters of the FCA can easily elude detection. Poaching is especially problematic around Fualopa islet, and is often conducted at night. Occasionally, fishermen who are passing by the FCA make voluntary reports of any observed illegal activities occurring in the area. However, it would be more effective if wardens from the community could be recruited and trained specifically for the purpose of increasing patrolling activities within the FCA, and enforcing regulations. Such a program could be modeled after similar ones that have been set up in other countries. In the Philippines, for example, the 'bantay dagat' ('sea guards') are recruited from the community and trained to perform patrolling and reporting functions. In some communities, they are sworn in as deputies, and have the authority to arrest violators. A number of different

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<sup>13</sup> It was reported that in the past, buoy markers had been deployed to delineate the FCA boundaries, however these are no longer in position. It is not clear whether the markers were intentionally removed by vandals or possibly lost due to strong storms.



incentive arrangements could be made to compensate the community wardens for their efforts.

In addition to wardens working as part of a mobile patrol force, some consideration has been given to the idea of permanently posting FCA guards or wardens on one or more of the islets within the management area. This would require setting up basic living accommodations and communications equipment. The constant presence of personnel tasked to conduct surveillance and report violators would be an effective deterrent that would help to curtail illegal activities in the FCA.

- **Harmonize the legal framework for enforcement.** The discrepancies in the levels of fines and punishments for violations in the FCA, as set forth in the Conservation Area Act and the by-laws, have already been described (Section 5.2.4). It is necessary that these anomalies be resolved and the Act and by-laws be made consistent. More importantly, the levels of fines and punishments should be set at a level that allows cases to be heard in the local island courts. These matters should be reviewed by a legal specialist, and any necessary changes drafted to the Act and/or by-laws.

### 8.1.5 Capacity Building

Interviewees and questionnaire respondents indicated that, although the personnel working on the FCA project had been well trained, and are highly motivated and quite capable, still they could benefit from further training regarding conservation management techniques and concepts, monitoring and survey techniques, and SCUBA diving methods and safety procedures. Also, it was reported that the two staff assigned as conservation officers cannot on their own handle all the tasks required for effective management of the FCA. In order to meet the needs for a larger pool of trained personnel, and in order to ensure that they are well-prepared to assume their responsibilities, it will be important to provide a range of training programs. These requirements can be met by implementing the following actions:

- **Expand the training of technical personnel (for monitoring, enforcement, management).** A good start has been made to develop a core group of capable people to be involved with the management of the FCA. However, their skills need to be broadened. More in-depth training should be provided to help develop knowledge and skills in the following areas:
  - community mobilizing
  - monitoring and survey techniques
  - patrolling and enforcement
  - business management and fund-raising
- **Strengthen NGOs to lead community mobilization efforts for environmental improvement.** Currently, a single small NGO, Island Care, has as its focus environmental advocacy. Efforts need to be undertaken to increase the membership of this NGO, and possibly, to facilitate establishment of other environmental NGOs. Such organizations have a large role to play in helping to disseminate knowledge about conservation issues; stimulating community participation in special environmentally-oriented events and activities; and conducting training to build capacity at the grass-roots level.

- **Conduct cross-visit training programs with other countries.** Because the FCA is the first and only such managed area in Tuvalu, it is necessary to look toward other countries to find examples of successful MPAs that can serve as models for cross-training purposes. Possible visitation sites should be selected based on similarities in biophysical conditions and social and economic setting (eg, small island ecosystem, only moderate fishing pressure, opportunities to develop revenue-generating activities for sustainability). Cross-visit training offers the unique advantage that trainees have the opportunity to meet with peers who share their management experiences, rather than being instructed by 'experts.' Trainees should be carefully selected as being hands-on implementors, rather than bureaucrats or administrators who are separated from day-to-day management activities.

### 8.1.6 Development of Mechanisms for Sustainable Financing

The feasibility of implementing all of the foregoing recommendations depends upon identifying sources of funding to sustain management activities over the long term. Lack of funds was consistently named as the major obstacle to effective management of the FCA. The potential sources of funding have already been identified by community informants. Each of these possible sources is briefly discussed here.

- **Grants or loans from development institutions (eg, bilateral funding institutions, SPREP, ADB, GEF, etc.):** Funds from these types of donors or lenders have traditionally been used to support start-up conservation efforts, in Tuvalu and in many other developing countries. The problem with this type of support is its finite nature—interviewees involved in the FCA project reported feeling disillusioned once the funding from SPREP was terminated. Such support is most beneficial if part of it is used to establish a system for sustainable financing so that a smooth transition can be made, once the donor funding ends. Ideally, conservation activities initiated with donor funds can later on be supported over the long-term through use of sustainable, internally-generated funds.
- **Allocations from a regional conservation trust fund:** With support from the SPBCP, efforts were recently made to investigate the feasibility of establishing a regional 'Pacific Island Conservation Trust' to provide long-term support for community-based conservation initiatives in the Pacific island countries. The proposal for such a Trust Fund was first presented at the Sixth Pacific Island Conference on Nature Conservation and Protected Areas in 1997. The intent was to structure the proposed Trust as an Association of Pacific National Conservation Trusts, with a central governing council overseeing a common capital fund. Each member nation would establish its own semi-autonomous statutory conservation trust, which would be responsible for disbursing funds to support various community-based conservation initiatives in the country (CALL Newsletter No. 9, 2001). A potential advantage of such a regional structure would be to encourage cross-pollination of ideas among various Pacific island countries, and greater cooperation toward developing a regional environmental strategy for biodiversity conservation. Despite these considerations, and four reports produced over six years expressing support for the formation of a regional Trust Fund, UNDP, the proposed executing agency, has not been receptive to the concept of setting up such a fund. Instead, it has been suggested that separate national trust funds would be more appropriate. Thus the possibility of funds soon becoming available through a regional trust appears to be remote.
- **Funding from National Government sources:** Several sources of funds are available to the Tuvalu government, from which money could be obtained to support conservation efforts. A **Tuvalu Trust Fund** (TTF) was established in 1987 with principal contributions coming

from Australia, New Zealand, and the United Kingdom. The Trust Fund was set up to help the government meet its basic financial obligations (TTF Advisory Committee 1997; Knapman et al. 2002). The fund consists of two components, an 'A' account which contains the principal used for investment, and a 'B' account which contains distributions from the 'A' account that may be reinvested into the 'A' account, held as a buffer, or withdrawn by the government as required to meet budgetary needs. Throughout most of its existence, the fund has yielded high returns, and the 'B' account has been an important tool for the government in managing its cashflow. Over the last few years, however, due to difficult economic conditions globally, returns of the Trust Fund have been poor. Nonetheless, with prudent planning, the TTF may be a reasonably reliable source that could be tapped to fund ongoing conservation efforts in most years. Possibly, back-up arrangements could be made with various donor or lending institutions, to support conservation efforts in those years when funding from the TTF could not be provided at the required levels due to unfavorable macroeconomic conditions. The GOT is also receiving a minimum of US\$2.2 million annually as part of a licensing arrangement for the use of its Internet domain name extension "**DotTV.**" In the case of funds coming either from the TTF or DotTV sources, the Government could at its discretion stipulate that a certain amount of funds be earmarked as dedicated financing for the purpose of supporting marine conservation in the FCA (and in any other conservation areas that may be established in the future).

- **Generating revenues through tourism and ocean recreational activities:** At present, tourist arrivals in Tuvalu are extremely limited, but increasing (Table 8). Also, the few non-residents arriving in Tuvalu annually make a significant contribution to the local economy (Table 9). Further development of tourism, especially dive tourism and ecotourism, has the potential to generate increased revenues for the country. This potential revenue stream, which is virtually untapped at present, offers a possible source of sustainable financing for continuing conservation efforts. The excellent condition of the reefs and associated marine life within the FCA, and especially the presence of large-size fishes that are easily approached by divers, is an outstanding attraction for dive tourists. This attraction is further enhanced by excellent water clarity, as well as the scenic beauty of the small islets of the lagoon. Additional ecotourism opportunities may be focused around special marine or coastal 'flagship' species, such as sea turtles or coconut crabs. In other countries (eg, Sri Lanka, Malaysia), 'turtle tourism' attracts many visitors, and generates revenues, part of which may be used to support conservation efforts. Sunken WWII airplanes and vessels at easy diving depths within other parts of the lagoon provide additional attractions to round out the experience for divers visiting Tuvalu. Other opportunities for ocean recreational activities in the lagoon may also be promoted. Sport fishing, windsurfing, ocean kayaking, and sailing are among the many activities that could be offered to enhance visitors' experience in Tuvalu.

At present, recognition of the dive potential of Tuvalu outside (and even inside) the country is virtually nil; only a single article, in a SCUBA-diving newsletter, is known to have been written about Tuvalu for an international SCUBA diving audience (Undercurrent, February 2002). One major existing constraint to developing such an industry, the need for better accommodations, may soon be adequately addressed with the planned construction of a new addition to the Vaiaku Lagi hotel.

The increased revenues that would be generated by attracting dive tourists through a tourism development campaign could be captured in a number of ways: (i) fees could be directly collected for visitor use of the FCA (eg, for boat trips and guides); (ii) other fees could be charged for uses outside the FCA, but which are based on benefits related to management

of the FCA (eg, fees for fishing or scuba-diving in other areas of Funafuti Lagoon, that benefit by increased populations of fish generated from the FCA); and (iii) taxes would be assessed on proceeds from sales or services to tourists, provided by private businesses. A portion of these funds could be recycled into supporting stepped-up conservation efforts, which would have both ecological and economic benefits. For these reasons, all avenues should be explored for promoting and developing a sustainable tourism industry in Tuvalu, with a focus on dive tourism in the FCA. The requirements for developing dive tourism in Tuvalu are discussed in Section 8.3.1.

**Table 8 Nonresident Arrivals in Tuvalu, by Purpose of Visit, 1997-2001**

YEAR	PURPOSE					TOTAL
	Holiday	Business	Visiting Friends / Relatives	Transit/ Stopover	Other Purposes	
2001	435	1,187	529	399	263	2,813
2000	139	460	178	354	147	1,278
1999	83	252	159	9	26	529
1998	213	475	192	36	90	1,006
1997	164	483	218	101	72	1,038

Source: Knapman et al. 2002.

**Table 9 Nonresident Arrivals by Market Area; Expenditures and Receipts, 1991**

Market Area	Arrivals 1991	Avg. Expenditure, per capita, US\$ (figures rounded)	Total Tourist Receipts US\$
Australia	130	261	33,922
New Zealand	67	291	19,524
Pacific Islands	543	296	160,779
North America	73	247	18,022
Europe	97	330	32,055
Other	66	312	20,573
TOTAL	976	292	284,875

Source: Tourism Council of the South Pacific. January 1992.

## 8.2 Replication of the FCA Model

### 8.2.1 Replication at Other Sites in Tuvalu

A number of the outer islands have already established their own fishery management systems that follow a more or less traditional structure. Three conservation areas, including at least one that pre-dates the FCA, were established on three outer islands—Vaitupu (earliest of the three, since approximately the 1980s), Nukulaelae (2001) and Nui (2002). These have all been self-initiated by the communities, and have not received any outside assistance. On Nukulaelae, by-laws have been enacted thru the Town Council (kaupule) for a traditional system of management that involves seasonal closures and restrictions on methods—spears and nets are banned from use in the lagoon. As a result, there has been an obvious improvement in fish stocks reported in the lagoon. The sites for these CAs are more easily managed and patrolled than in Funafuti,

because they are in close proximity to the main population centers. Despite their general success, some violations still occur.

Due to the relative success of establishing the FCA as an effective sanctuary for protecting breeding stocks of important target species of fish, residents of other islands, notably Nui, Vaitupu, and Nukufetau, have made requests for assistance to set up similar conservation areas. The application of the Funafuti model at other sites around the country may need to be modified to incorporate site-specific local “traditional ecological knowledge and wisdom” (TEKW) into the management structure at each new location. Because traditional systems have persisted in these islands, any new management system being introduced should be designed in harmony with traditional practices. In fact, in these cases, it is likely that traditional systems can provide an excellent basis for the formulation of usable regulations aimed at conserving valuable fisheries and other marine resources. The long-standing acceptance by the community of the traditional management regulations can help to ensure a high level of acceptance of a comprehensive conservation program.

Technical assistance for the outer islands will probably be most useful if it is applied in helping to set up awareness-building programs, develop enforcement procedures, and generally facilitate community-based planning and management activities. Final decisions about the substance and structure of the management system, however, should be left to the communities concerned.

### 8.2.2 Replication Elsewhere in the Region

The principles of building a conservation program around TEKW may also be applied in many countries around the region. Examples of traditional conservation practices that are still found in the region include the *ra’ui*, a traditional type of marine reserve found in the Cook Islands (Ponia 2001); periodic restrictions called *fono* that are applied from time to time to allow recovery of exploited resources in temporary reef ‘reserves’ in Niue (Wells and Jenkins 1988a); and community-based turtle and giant clam management practices found in Tokelau (Wells and Jenkins 1988b), among others. Such traditional practices may serve as cornerstones for integrated conservation programs, and also should help to win acceptance within the community.

In other areas where traditional management methods are no longer practiced, there may be a need to depend to a greater degree on a more ‘modern’ system of management (similar to that which has been developed for Funafuti). In each specific situation, design of a management system that is appropriate to the needs of the resource users can be ensured by involving a broad range of community stakeholders in the planning process from the early stages.

Regionally, it is also important to consider various ways in which CAs could be linked together into cohesive networks for management. One common theme that may link various conservation areas is based on the ecological interrelationships that may exist among them. For example, based on location and prevailing water currents, one MPA may serve as a source area of fish and coral larvae, that may be transported and may serve to repopulate depleted reefs in other ‘downstream’ MPAs. Management efforts for this cluster of MPAs could therefore emphasize preserving this biophysical connection between the MPAs in the group. Opportunities for regional coordination and cooperation in management should also be explored. As an example, cross-visit training activities could be established among different countries within the region, to encourage the exchange of ideas as a means of generating effective solutions to common management problems.

### 8.3 Mainstreaming of Environmental Concerns in the Development Process

As discussed in Section 5.2.8, the failure to effectively mainstream conservation as an integral part of the national economic and development policy framework, has resulted in a somewhat weak structure for conservation efforts in Tuvalu. Successful mainstreaming requires that the following steps be taken:

- Decision-makers must recognize the significant economic, social, and environmental benefits to be derived through conservation of important marine biodiversity and fisheries resources (as analyzed in Section 7). Awareness-building and training should be provided to ensure that key policy-makers have the requisite knowledge to make informed decisions.
- Regular funding allocations need to be made both from national government and town council budgets, to support continuing conservation. A funding framework should be established to ensure that conservation efforts always receive adequate support. Because of its importance to the national interest, funding for conservation should be prioritized, and not reduced or eliminated due to political considerations.
- Action needs to be taken to modify, update, or create necessary legislation to strengthen conservation efforts. Laws need to be harmonized and made enforceable through the island judicial system.
- Conservation must be linked to activities in other sectors, so that these activities can develop synergistically and so that cross-sectoral coordination is improved. This can also create new avenues for funding support. Specific suggestions for strengthening cross-sectoral linkages as part of the mainstreaming process are discussed in greater detail in the next sub-section (Section 8.3.1).

By taking these steps to mainstream and integrate conservation into the national planning and economic agenda, the government can demonstrate its commitment to improving food security, providing for the basic needs of Tuvaluans, and preserving a valuable resource that can help to stimulate greater economic growth.

#### 8.3.1 Coordinating Marine Conservation with Activities in Other Sectors

A number of important activities across various sectors would not be viable without a healthy environment and natural resource base. In particular, tourism development and fisheries in Tuvalu cannot be sustained in the absence of productive marine ecosystems and associated resources. It is important to consider these interdependencies, to try to develop a framework that can capitalize on and promote such cross-sectoral synergies. Some examples are presented here.

In the fisheries sector, one relatively new development is the establishment by the Fisheries Department of a **giant clam hatchery**. The intention of the project is to produce clams that can then be used to re-stock the depleted giant clam populations in the lagoon. A similar effort was made several years ago with trochus.<sup>14</sup> In that case, a large quantity of trochus were purchased and were scattered around various sites in the lagoon, in an effort to seed the reef so that ultimately trochus populations would multiply and the shells could be harvested on a sustainable

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<sup>14</sup> *Trochus niloticus* is a mollusk of economic importance primarily for its mother-of-pearl shell, used in making buttons.

basis. Unfortunately, despite an information campaign advising residents not to collect the trochus from the reef, most of the shells were harvested soon after being planted. Thus the goals of this project were never realized. For the giant clam, and in fact, for other, similar marine products that may be cultured in the future, the sanctuary at the FCA affords an area where the organisms could grow, reach reproductive maturity, and spawn to re-establish their clam populations throughout the lagoon.

The potential to develop **dive-oriented ecotourism** in Tuvalu has already been discussed. While the concept is appealing, there are many barriers that would need to be removed first, in order to make this a reality. The main requirements are to:

- lower the airfare for visitors to Tuvalu
- provide more comfortable accommodations
- provide for easier access to foreign currency exchange services
- ensure that diving can be done safely, by providing safe boats, air compressors, and dive equipment, and a well-trained and competent dive crew
- explore the best ways to market Tuvalu as a dive destination

In addition, a full survey of potential dive sites should be conducted, and the sites mapped and described. Mooring buoys can be placed strategically at selected sites, to allow easier mooring and to minimize anchor damage to coral reefs.

Other activities could be developed to complement marine ecotourism, and bring in increased revenues. For example, cottage industries could be developed to produce handicrafts, to be offered for sale to this new tourism segment, and businesses could be set up to offer tour guide services.

One ambitious scheme that is presently under consideration by Government (and of which tourism development is a part), involves **outer island development** in Nukufetau. A 2.6-km-long, WWII-era runway (twice as long as the runway on Fongafale) is located on Nukufetau is 2.6km long, twice the length of the runway on Funafuti. The strategy being considered proposes that this runway could be rehabilitated at relatively low cost, and used to bring in larger aircraft, possibly 737s. If this is accomplished, it would enable Tuvalu, for the first time, to export its own fresh fish, primarily yellowfin tuna for the sashimi market, to Japan.<sup>15</sup> It is envisioned that this development would also bring about the following benefits:

- by opening up new possibilities for air transportation, enable tourists to visit Tuvalu more economically, and also enable them to more readily make inter-island trips;
- because of new job opportunities, attract a portion of the people presently living in Funafuti (perhaps most likely, those who originally came from Nukufetau) to move back to Nukufetau, thereby reducing population pressure on Fongafale
- bringing about net environmental benefits (reduced pollution, reduced fishing pressure) as a result of reducing the population pressure on Fongafale.

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<sup>15</sup> This scheme is being presented here in a simplistic fashion. In order for the scheme to be considered seriously, it will be necessary to undertake a number of in-depth studies, not the least of which being a market analysis for sashimi-grade tuna. Other obstacles, such as transportation costs and high fuel prices, may make it impossible to consider this option at this time.

### 8.3.2 Coordination with Global Programs

There are a number of global programs that have relevance for the FCA project, and for the establishment of other managed protected areas in Tuvalu and in the region. The Global Environment Facility (GEF) provides funding for covering the incremental costs of achieving globally-significant environmental benefits. Biodiversity conservation is one of the focal areas supported by GEF. As a signatory to the international Convention on Biological Diversity (signed June 1992, ratified February 2003), Tuvalu has indicated its willingness to subscribe to the policies recommended under the Convention, and at the same time may qualify for GEF funding for eligible conservation efforts.

The ReefCheck program is a relatively new program but one that is already being implemented in many countries worldwide. ReefCheck is intended to foster community awareness and community management of coral reefs and other coastal resources, by training and engaging community stakeholders to participate in periodic reef monitoring activities. Support from these and similar global institutions can help to strengthen and maintain conservation programs in Funafuti and elsewhere in Tuvalu.

### 8.4 Implementing the Recommendations

The key recommendations presented here may be considered as an integrated package of targeted actions that can help to improve protected area management. Most of the recommendations pertain specifically to improving the management and operation of the FCA, while a few pertain to initiating management efforts on the outer islands or in other nearby nations.

Confining attention to those recommendations specifically for Tuvalu, the GOT does not yet possess the capability to fully carry out these actions on its own; technical assistance will be required to help to prepare the community, to train assigned personnel, and to help coordinate a range of community-based planning, design, and management functions.

In order to define the requirements for technical assistance consultants, “Outline Terms of Reference for Advisory Technical Assistance for the Improvement of Marine Conservation in Funafuti Lagoon” have been prepared, and are found in Annex F.

## 9. Implications Beyond the Region

Perhaps the most important finding of this case study is that the FCA presents tangible observed evidence that MPAs can help to protect breeding stocks of fish and important biodiversity resources. Reports from local fishermen corroborate these observations. After about six years under management, fishermen have already reported that they are experiencing the benefits from this—that fish are larger and more plentiful now, than they were before the establishment of the FCA, even outside the boundaries of the CA itself, due to the predicted effect of export of excess biomass. As a result, fishermen find it easier to catch fish in the permitted fishing areas of the lagoon, and they are among the staunchest supporters for maintaining the FCA as a no-take zone.

This is important because in many developing countries, especially in such populous nations as Indonesia and the Philippines, commercial and artisanal or subsistence fishermen alike, do not fully recognize the importance of maintaining zones where breeding stocks are left untouched—continuing violations of fisheries laws are commonplace. To be fair, fishing pressure in some of



these nations is much, much higher than in Tuvalu, and fishers in these countries often must resort to drastic measures (including destructive fishing practices that do irreparable damage to coral reefs and the fisheries resource base itself), in order to provide for the basic food needs of their families. The dilemma is that, as fishing pressure increases, maintaining the integrity of MPAs, sanctuary areas and no-take zones becomes ever more critical. As long as it is properly managed, the FCA can serve as an important model to demonstrate how lowering fishing pressure can increase the resource base, and how protected areas can function to preserve or replenish fisheries resources in order to allow continuous sustainable harvesting to occur. Hopefully, lessons from Funafuti may eventually have an impact in changing the patterns of destructive fishing practices in other countries.

## **Annexes**

- A. References
- B. Persons Consulted
- C. Outputs of Group Discussions and Meetings
- D. Results of the Questionnaire Surveys
- E. Results of the Field Surveys
- F. Outline TOR: Advisory Technical Assistance for Improving Marine Conservation

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**Annex A: References**

*The following references were used in the compilation of this report. Key source materials are cited in the text.*

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### **Annex B: Persons Consulted**

Rt. Hon. Saufatu Sopoanga, OBE, Prime Minister

Rt. Hon. Bikenibeu Paeniu, Minister of Finance

Mr. Panapasi Nelesone, Secretary to Government

Mr. Paani Laupepa, Assistant Secretary, Foreign Affairs

Mr. Iakoba Italeli, Attorney General

Mr. Semese Alefaio, Conservation Officer, Conservation Office, Funafuti Town Council

Mr. Nikolasi Apinelu, Fisheries Research and Development Officer, Fisheries Department

Mr. James Conway, Special Advisor, Office of the Prime Minister

Ms. Annie Homasi, Project Coordinator, Tuvalu Association of NGOs (TANGO)

Mr. Solomona Ielemia, President, Funafuti Town Council

Mr. Simeona Iosia, (former) Secretary, Funafuti Town Council

Mr. Teleke Lauti, (former) Conservation Area Support Officer (CASO)

Mr. Panapasi Nelesone, Secretary to Government

Ms. Kilita Nokisi, Conservation Officer, Funafuti Town Council

Mr. Talakatoa O'Brien, Secretary, Funafuti Town Council

Mr. Soloseni Penitusi, President, Funafuti Fishermen's Association

Mr. Satalaka Petaia, Director of National Fishing Corporation of Tuvalu (NAFICOT)

Mr. Samasoni Sauni, Secretariat of the Pacific Community (Noumea, New Caledonia)

Ms. Fuli Siaosi, Aquaculture Officer, Fisheries Department.

Mr. Mataio Tekinene, Director of Environment

Mr. Malaki Tihala, Deputy Director of Fisheries

Ms. Olioliga Iosua, Assistant Secretary of Natural Resources

Mr. Eti Esela, Businessman

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## Annex C: Outputs of Group Discussions and Meetings

**11 March 2003**

**Round-Table Discussion, Tuvalu Youth Center Building, Vaiaku, 2:30-5:30pm**

### AGENDA

- Introductory Remarks — Mr. Paani Laupepa
- Explanation of the ADB Pacific Region Environmental Strategy Project and the Tuvalu Case Study — Mr. James Berdach
- Meeting Schedule and Commitment
- Distribution of Questionnaires
- Round-Table Discussion on Key Issues (topics to be discussed may include perceptions on impacts or benefits of the FCA; requirements for long-term management; public awareness-building and education; traditional vs. modern management system; financial and budget considerations)
- Closing Remarks — Mr. Talakatoa O'Brien

The round-table was convened at 2:30 p.m. It was attended by some ten participants (Table C-1, Figure C-1). The meeting was opened by Mr. Paani Laupepa, who explained the purpose of the ADB Pacific Region Environmental Strategy (PRES). Mr. James Berdach then gave further background about the PRES project and how the Tuvalu case study would fit into the overall project. Agreement was solicited from the attendees regarding the agenda for the discussion.

Participants next completed questionnaires that explored their perceptions about the FCA project (the questionnaire is presented in Annex D). The questionnaire helped to stimulate and focus participants' thoughts on certain key issues.

A round-table discussion followed. The discussion targeted several topical areas. These subjects, together with the main findings, are presented here.

- **perceived impacts or benefits of the FCA:** Despite some initial questions about the real benefits to be derived from the CA, there was general consensus that the FCA is functioning well in protecting fish and should remain as a protected area—the concern is that an effective management system be instituted to ensure that the area continues to function as it is intended. If the management is ineffective (eg, with frequent violations going unpunished), it defeats the entire purpose of the CA
- **requirements for long-term management:** The community needs to be fully involved with the management of the FCA. Although there is a structure for community involvement in the management of the CA (a diagram depicting the flow of community involvement in the management process was developed during the discussion; see Figure 4-B), it seems that the process of management has not functioned properly. For example, the Conservation Area Coordinating Committee (CACC), a body representing community interests in the management structure, has not met in about two years. This needs to be improved. Also, although there are rules that have been formulated for controlling activities in the FCA, there is no overall management plan that has been developed. The concept of volunteerism is relatively unknown—people prefer getting paid for their efforts. Technical training for management of the area also needs to be given. In addition, it was mentioned that managers should lead by example and not abuse their authority.

- **public awareness-building and education:** Awareness-raising and educational activities need to be continued. Teaching children is especially important since they are often the effective carriers of information to their parents. Awareness-building efforts should include radio programs, information brochures, etc. The last organized information-dissemination activities were over two years ago.
- **enforcement:** Some fishermen help in enforcement by reporting observed violations and conducting informal patrols. However, sometimes they expect that they should be paid a fee if they file a report. Most feel that present enforcement efforts are not adequate; violations continue to occur. The fishermen present at the discussion were especially concerned about this. Stationing a CA warden permanently on one of the small islets is being considered. It would also be useful to have buoy markers to delineate the area, so that fishermen and enforcers can easily identify the CA boundaries (buoys were installed in the past, but they were either lost in storms or vandalized).
- **traditional vs. modern management:** There are traditional management systems being practiced on the outer islands, especially Nukulaelae, Vaitupu, and Nanumanga. In those places, the village elders decide if temporary closures or other restrictions are needed to allow depleted fish stocks to recover. It was felt that a traditional system would not function too well in Funafuti, because it is a mixed community (many people living in Funafuti come from other islands), and a larger population. A more rigorous, 'modern' management framework may be more effective in controlling the increased fishing pressure found here. The FCA model may also provide useful lessons that could be applied to management on the outer islands as well.
- **financial and budget considerations:** A recurrent theme was that lack of continuous financial support was severely hampering conservation activities, and threatening the long-term viability of the FCA. Support is needed for ongoing awareness-building and educational activities; for formulation of a management plan; for various enforcement activities; for materials and equipment; and for support of staff, among others. Possible sources of funding that were identified include outside donors; licensing fees for fishing (fishermen currently pay both licensing fees and fees based on their sales of fish); revenues that could be generated through tourism development (especially dive tourism); and operation of the interpretive center. Fishermen indicated that they would be willing to pay (or provide in-kind services) for being allowed to participate in a 'safety-at-sea' program whereby the Conservation Office would assist fishermen by providing weather information, search and rescue services, and sales of safety equipment.
- **other comments:**
  - The importance of equitably distributing benefits from the use of the FCA was pointed out; so far there is no mechanism for this.
  - Extensive discussion was devoted to an occurrence in 2002, when, at the request of Government, the FCA was opened to fishing for a period of two days to provide fresh fish for visiting dignitaries. It was strongly voiced that such 'special exceptions' undermined the integrity of management efforts in the FCA. While there is apparently a provision for making such special exceptions, they should be made (if ever) with the full knowledge and consent of the community (as represented by the CACC), and with fair compensation being paid in return for such privileges.

The meeting was adjourned at 5:30 p.m.

**Table C-1 List of Participants — Round-Table Discussion**

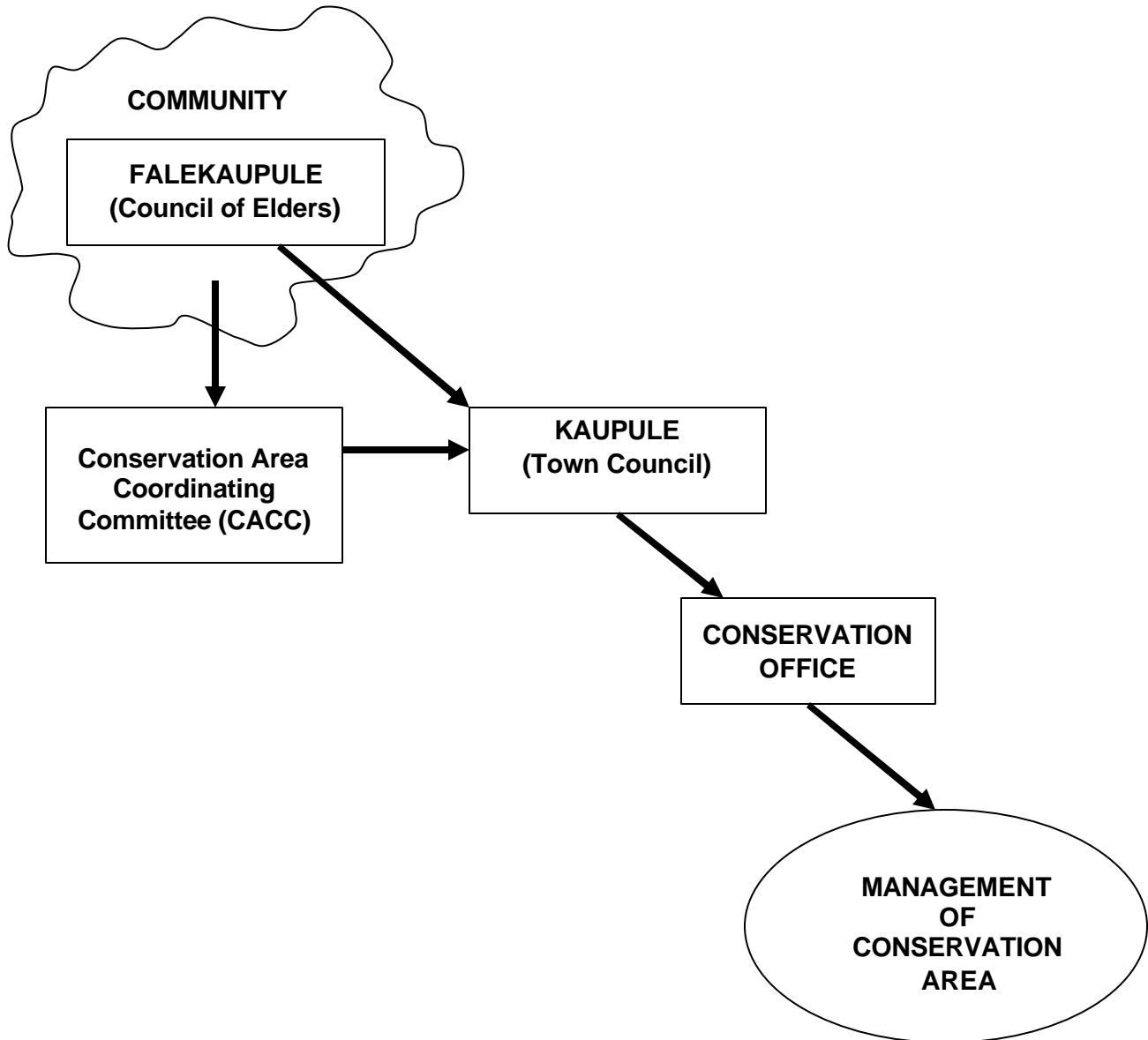
<u>Name</u>	<u>Affiliation</u>	<u>Position/Title</u>
Mr. Paani Laupepa	Foreign Affairs	Asst. Secretary
Ms. Kilita Kaitu	Conservation Area Project	Conservation Officer
Ms. Pepetua Latasi	Department of Environment	Assistant Environmental Officer
Mr. Talakatoa O'Brien	Funafuti Town Council	Secretary
Mr. Soloseni Penitusi	Funafuti Fisherman Association	President
Mr. Pasefika P.	Funafuti Fisherman Association	member
Mr. Setusa T.	Funafuti Fisherman Association	member
Mr. Nikolasi Apinelu	Fisheries Department	Fisheries R& D Officer
Ms. Siuila Toloa	Island Care NGO	(primary school teacher)
Ms. Temukisa Hauma	Island Care NGO	(head teacher-primary school)
Mr. James Berdach	ADB	CRM/Protected Areas Specialist

**Figure C-1 Participants During the Round-Table Discussion**





Figure C-2 Preliminary Schematic Diagram Showing Flow of Authority for Management of the Funafuti Conservation Area



**20 March 2003**

**Wrap-Up meeting, Tuvalu Youth Center Building, Vaiaku, 2:30-4:15pm**

A wrap-up meeting was held to present the preliminary findings of the case study to community members and CA managers. The participants are listed in Table C-2.

**Table C-2 List of Participants**

<b>Name</b>	<b>Affiliation</b>	<b>Position/Title</b>
Semese Alefaio	Funafuti Town Council Conservation Office	Conservation Officer
Kilita (Nokisi) Kaitu	Funafuti Town Council Conservation Office	Conservation Officer
Pepetua Latasi	Department of Environment	Assistant Environmental Officer
Siuila Toloa	Island Care NGO	(primary school teacher)
Soloseni Penitusi	Funafuti Fisherman Association	President
Pasefika P.	Funafuti Fisherman Association	member
Temukisa Hauma	Island Care NGO	(head teacher-primary school)
Fatulolo Vave	NAFICOT	Acting Manager
James Berdach	ADB	CRM/Protected Areas Spec'list

Following introductory remarks, Mr. Berdach gave a brief presentation of some of the in-progress findings of the case study, especially based on preliminary results of returned questionnaires, and field surveys. The findings reported were as follows:

- **Results of questionnaires:** it was noted that only those questionnaires distributed at the round-table meeting had yet been tabulated. The community questionnaires were not all returned yet and had not been tabulated. However, based on the 'managers' questionnaire distributed at the round-table, it was observed that (i) the opinion of respondents was almost evenly divided regarding the effectiveness of the FCA project in building greater awareness; (ii) respondents expressed strongly the need for more technical training and capacity-building of personnel to help to monitor and manage the FCA; (iii) it was unanimously observed that better enforcement is required in the FCA; (iv) respondents were nearly unanimous in the view that the FCA was functioning effectively as a fish sanctuary; (v) it was expressed strongly that the FCA should continue to exist as a conservation area; (vi) the respondents were unanimous in their opinion that greater community support was needed for the long-term viability of the CA; and (vii) there was a high degree of uncertainty among the respondents about how to best sustain the CA especially as regards financing.
- **Observations made during the field surveys:** it was noted that a number of areas within the FCA (Tefala, Fuafatu) supported high biomass and high biodiversity. The large size of fish at these sites was particularly notable. These and other observations support the idea that the FCA appears to be functioning effectively as a sanctuary and breeding-ground for fish and other organisms. At the same time, however, it was observed that at least at one

location within the CA (Fualopa), coral coverage is degraded and there is low fish biomass and diversity. The reasons for this are not clear but are likely due to one or more factors including natural differences in community structure, coral bleaching, and/or poaching and continuing fishing pressure (this area is reported by the conservation officer to be a favored fishing site historically, and a likely poaching site). Other possible anomalies are seen in the fact that the two sites surveyed outside the CA (Tepuka and S. Fongafale) also support relatively high biomass and good biodiversity (although with somewhat smaller sizes of fish noted at these sites, as compared to the best sites within the CA).

Following the presentation of these findings, a general discussion was opened to obtain further feedback from the participants. Items discussed included:

- **integrated management plan:** the absence of a management plan was noted. The question was put to the conservation officer about how he managed the CA in the absence of a well-defined plan. It was indicated that basically management was done on an ad hoc basis, with the conservation officer using his best judgment to try to effectively manage the area. The need to develop a plan that integrates management within and outside the CA (ie, in the rest of the lagoon, including management of land-based activities on Fongafale and the other islets) was discussed. This concept was generally endorsed by the group.
- **awareness-building:** the participants recalled that in the early stages of the SPREP-supported project, there was a vigorous program for education and awareness-building, which was very much appreciated by the community. However, those activities have since ceased due to lack of funds. It was agreed that this is an important component that needs further promotion and support. The possibility of utilizing the existing Interpretive Center (which at present is a vacant building) was discussed. Such a center would have the potential to serve as a physical focal point for all awareness-building programs and activities within the community.
- **legal inconsistencies:** the inconsistencies that exist with regard to legal requirements and enforcement matters were discussed. There are inconsistencies in the levels of fines and imprisonment specified in the Conservation Areas Act and the Town Council's By-Laws for the FCA. Also, it was noted that the local courts have no jurisdiction over violations of the CAA and the By-Laws (since the penalties in both sets of regulations exceed those prescribed for adjudication in local courts). This effectively makes it impossible to get timely convictions, even if violators are caught and arrested.
- **sustainable financing:** the biggest challenge being faced in the management of the FCA is identifying viable mechanisms to provide for sustainable financing of conservation activities. Options discussed included donor funding, support by government through annual budget allocations, support from a trust fund (either Tuvalu Trust Fund or a special conservation trust fund), and new economic activities (such as ecotourism). Sustainable financing is needed to support ongoing staffing, awareness-building, training, and enforcement.

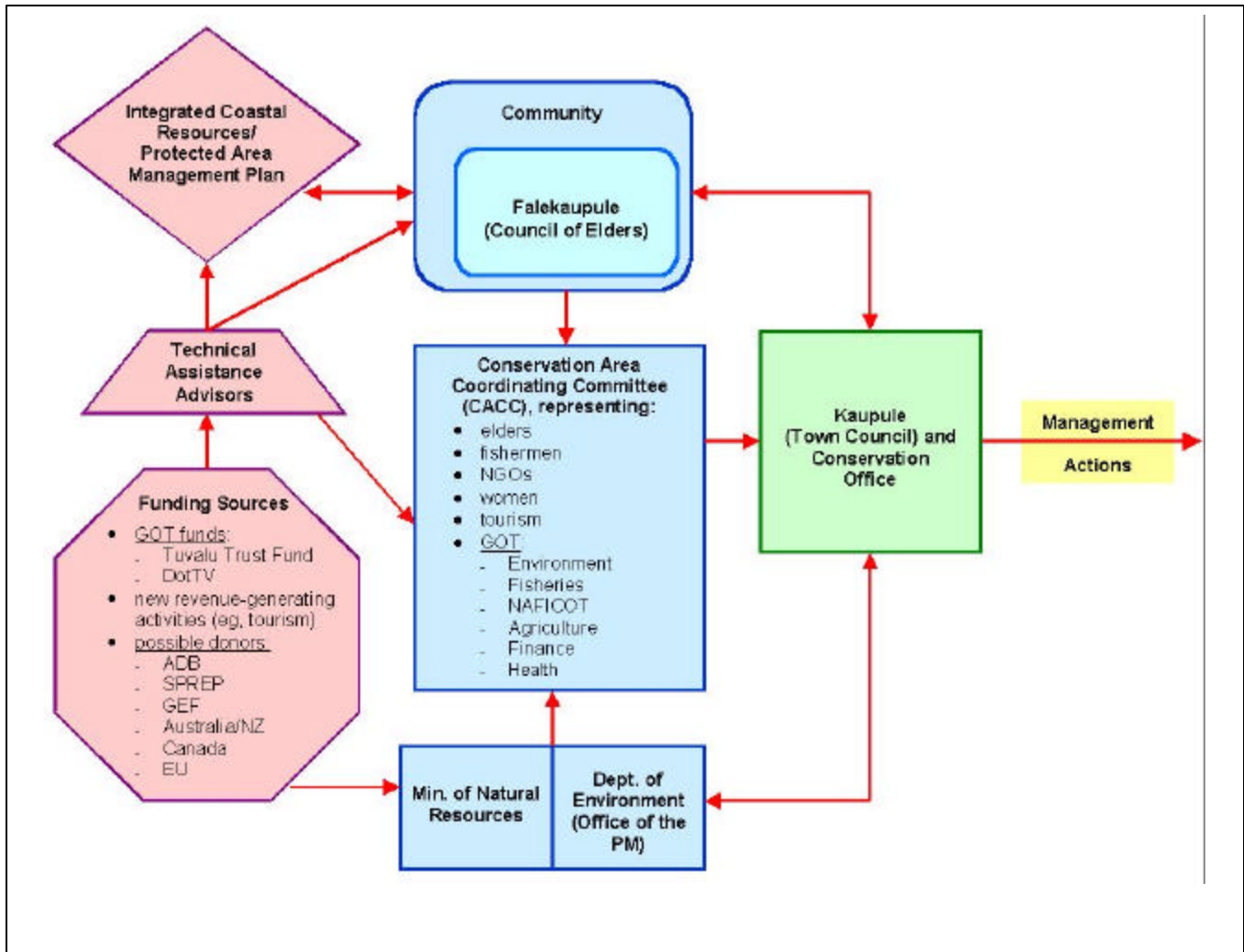
Discussion of the above issues led to consideration of the framework for management of the FCA, the authority of various entities with respect to FCA management, and how authority is passed to the Conservation Office as the ultimate responsible management entity. This discussion (Figure C-3) resulted in refinement of the flow chart that had been developed at the Round-Table Meeting. The modified flow chart is shown in Figure C-4.

**Figure C-3. Wrap-Up Meeting Discussion**



Mr. Semese Alefaio, Conservation Officer, leads group discussion during the wrap-up meeting to develop a flow chart depicting FCA management structure.

**Figure C-4 Revised Schematic Diagram Showing Flow of Authority for Management of the Funafuti Conservation Area**



## Annex D: Results of the Questionnaire Surveys

Presented here are two questionnaires that were circulated among two groups of respondents within the Funafuti community. Questions differ from one questionnaire to the other, and were tailored with the intent of gathering as much useful information from each respective group of respondents. One questionnaire was circulated among “managers,” those having a high level of knowledge about and involvement with the FCA. The second set of questionnaires was circulated among persons within the general population of Funafuti. Cumulatively, representation within these groups included teachers, schoolchildren, business people and professionals, landowners of islets within the FCA, civil servants, members of NGOs, and fishermen, among others. Responses to both of the questionnaires are tabulated, and the answers are briefly interpreted here. Interpretation of the answers includes consideration of additional comments that were written-in on some of the questionnaire forms.

### Questionnaire for Managers’ Round-Table Discussion Funafuti Conservation Area—Case Study

Please circle the LETTER in front of the statement that you agree with the most.

QUESTIONS / STATEMENTS	Responses
<b>Question #1:</b> A. As a result of the FCA project I became aware of the importance of coral reefs. B. I already knew all about coral reefs before the FCA project. C. I knew a little about coral reefs, but the FCA project helped improve my knowledge. D. I don't think coral reefs are very important—corals are just rocks.	5 0 5 0
<b>Question #2:</b> A. Most people in Funafuti know about the Conservation Area. B. Only a few people in Funafuti know about the Conservation Area.	5 5
<b>Question #3:</b> A. A resource center has been put up where people can go to obtain more information about the FCA if they want to. The center is open to all citizens and visitors to Funafuti. B. There was a plan to put up a resource center, but so far it has not been established. C. There is not yet a proposal to establish a resource center. Unanswered	6 1 1 2
<b>Question #4:</b> A. There is a definite need to establish a resource center to share more information about the FCA and about conservation issues. It should have a library, computer and other learning materials. B. A resource center is not necessary. Unanswered	9 0 1
<b>Question #5:</b> A. There are many people in Funafuti who have the skills and knowledge needed to continue to manage the FCA effectively in the future. B. There is a need to have more training to help more people in Funafuti gain the skills needed to continue to manage the FCA effectively in the future. Unanswered	0 9 1

QUESTIONS / STATEMENTS	Responses
<p><b>Question #6:</b></p> <p>A. The available manpower is adequate for patrolling the FCA, apprehending violators, and enforcing the regulations.</p> <p>B. More manpower is needed for adequate patrolling and enforcement in the FCA.</p> <p>Unanswered</p>	<p>1</p> <p>8</p> <p>1</p>
<p><b>Question #7:</b></p> <p>A. A number of people received training in scientific survey methods, and they are capable of continuing this task in the future. No additional training of personnel for survey work is needed.</p> <p>B. Although some people were trained for survey work, they could use more training to improve their skills, and also new people should be trained to help with this task.</p> <p>C. No one is properly trained to conduct survey work in the FCA.</p> <p>Unanswered</p>	<p>0</p> <p>6</p> <p>2</p> <p>2</p>
<p><b>Question #8:</b></p> <p>A. There are enough boats, radios, and other equipment (for example, scuba gear) that can be used in patrolling, monitoring and surveying of the FCA.</p> <p>B. There is a need for more or better equipment to be used in patrolling, monitoring and survey activities for the FCA.</p>	<p>1</p> <p>9</p>
<p><b>Question #9:</b></p> <p>A. As a result of the establishment of the FCA, it seems that the numbers of coconut crabs and birds on the islets are increasing.</p> <p>B. I don't think there are more coconut crabs and birds now, than there were before the FCA.</p> <p>Unanswered</p>	<p>7</p> <p>0</p> <p>3</p>
<p><b>Question #10:</b></p> <p>A. As a result of the establishment of the FCA, it seems that the number of fish in Funafuti Lagoon has increased, the fish are larger, and it is easier now to catch fish than before.</p> <p>B. Because people are not allowed to fish inside the FCA, it is more difficult to catch fish now.</p> <p>C. The number of fish is still the same, they are the same size, and it is just the same catching fish as it was before.</p> <p>Unanswered</p>	<p>8</p> <p>1</p> <p>0</p> <p>1</p>
<p><b>Question #11:</b></p> <p>A. Fishermen of Fongafale should be allowed to fish wherever they want to in the lagoon. There will always be plenty of fish in the lagoon.</p> <p>B. Fishermen of Fongafale should realize that it is important to protect a part of the lagoon, so that the fish have a place where they can survive long enough to reproduce, so there will always be plenty of fish in the lagoon.</p>	<p>0</p> <p>10</p>
<p><b>Question #12:</b></p> <p>A. Most people in Fongafale think the conservation area is a good idea.</p> <p>B. Only a few people in Fongafale think the conservation area is a good idea—most people think it is a waste of time.</p>	<p>8</p> <p>2</p>

QUESTIONS / STATEMENTS	Responses
<p><b>Question #13:</b></p> <p>A. The establishment of the FCA was done with the full cooperation and support of the people of Funafuti.</p> <p>B. Some people came to Tuvalu and told us that it would be a good idea to have a conservation area, so we just did what they told us to do.</p>	<p>7</p> <p>3</p>
<p><b>Question #14:</b></p> <p>A. The management of the FCA is being carried out by paid staff only, but it would be a good idea if volunteers from the community also participated.</p> <p>B. The management of the FCA is being carried out by paid staff and community volunteers.</p> <p>C. The management of the FCA is being carried out only by community volunteers.</p>	<p>10</p> <p>0</p> <p>0</p>
<p><b>Question #15:</b></p> <p>A. A management plan was prepared for the FCA with the full participation of the community.</p> <p>B. A management plan was prepared for the FCA, but without the participation of the community.</p> <p>C. No management plan has yet been prepared for the FCA.</p> <p>Unanswered</p>	<p>2</p> <p>2</p> <p>2</p> <p>4</p>
<p><b>Question #16:</b></p> <p>A. Revenues have increased since the establishment of the FCA, through increased ecotourism, collection of permit fees and other economic activities.</p> <p>B. No additional revenue has yet been generated as a result of establishing the FCA.</p>	<p>6</p> <p>4</p>
<p><b>Question #17:</b></p> <p>A. The management of the FCA is the responsibility of the Funafuti Kaupule and it is a traditional system of management. This is the appropriate way in which the FCA should be managed.</p> <p>B. The management of the FCA is the responsibility of the Funafuti Kaupule. It is not a traditional management system, but it is working well and should be continued this way.</p> <p>C. The management of the FCA is done in a modern, non-traditional way, which is not well-accepted by Tuvaluans. A traditional system set up by village elders would be better.</p> <p>Unanswered</p>	<p>2</p> <p>3</p> <p>2</p> <p>3</p>

## Interpretation of Responses

The responses from the “managers’ group” offer a number of interesting insights regarding the perceived effectiveness of the FCA project. The responses are interpreted here, with respect to a number of key issues.

### ***Awareness Building***

The respondents seem to generally feel that their own awareness about marine conservation was improved significantly through exposure to the project. However, they are ambivalent with respect to the effectiveness of the project in raising awareness within the general community—about half the respondents feel that many people in the community are not aware of the project.



There is a definite consensus that awareness-building activities need to be continued and strengthened.

### ***Training and Capacity-Building***

The respondents believe that, while some personnel received technical training, there is a definite need to improve their skills, and also for others in the community to be trained to help shoulder the responsibilities for management of the CA.

### ***Community-Based Planning and Management***

While the respondents feel that the planning of the FCA was carried out with the participation of the community, greater participation is needed to continue to manage the area effectively. Volunteerism needs to be encouraged. There was some ambivalence about the management system—in the opinion of the respondents it is not clear whether or not the system employed (working through the kaupule, but using modern scientific methods) should be considered a modified traditional system, but about 50 percent feel the system is working reasonably well. Another 20 percent question this framework and believe that a more purely traditional system would be better.

### ***Enforcement***

There is a strong consensus that enforcement efforts are inadequate and need to be strengthened. The FCA should continue to be operated as a no-take zone.

### ***Tangible Benefits***

Respondents indicate their strong belief that fish populations, as well as birds and turtles, have increased as a result of the FCA project.

## **Questionnaire for Community Members Funafuti Conservation Area—Case Study**

A study is being done about the Funafuti Conservation Area (the FCA). Your answers to the following questions will help us to know if the project has been successful. It will only take about 5 to 10 minutes to complete this questionnaire—we appreciate your taking the time to answer these questions. THANK YOU!

<b>INFORMATION ABOUT RESPONDENT</b>	
NAME (optional):	--
MALE OR FEMALE:	M: <b>15</b> / F: <b>10</b>
ISLAND OF ORIGIN:	Funafuti: <b>14</b> / Other: <b>11</b>
AGE:	up to 15: <b>7</b> / 16-25: <b>2</b> / 26-40: <b>8</b> / 41-60: <b>6</b> / 61-up: <b>2</b>
EDUCATION (grade level):	none or no answer: <b>7</b> / primary or secondary: <b>11</b> / college: <b>7</b>
OCCUPATION:	see description in text
ANNUAL SALARY OR INCOME:	mostly unanswered

For each of the following questions, please circle the LETTER in front of the statement that you agree with the most. There are no right or wrong answers but we want to know your thoughts and opinions about these questions.

QUESTIONS / STATEMENTS	Responses
<b>Question #1:</b>	
A. I have already heard about the Funafuti Conservation Area (the FCA).	23
B. This is the first time for me to hear about the FCA.	1
No answer	1
<b>Question #2:</b>	
A. As a result of the FCA project I became aware of the importance of coral reefs.	7
B. I already knew all about coral reefs before the FCA project.	4
C. I knew a little about coral reefs, but the FCA project helped improve my knowledge.	14
D. I don't think coral reefs are very important—corals are just rocks.	0
<b>Question #3:</b>	
A. The purpose of the FCA is to prevent fishermen from fishing.	0
B. The purpose of the FCA is to protect fishes and other creatures in the area, so that there will always be enough fish for people to catch in other parts of the lagoon.	25
C. I do not understand the purpose of the FCA.	0
<b>Question #4:</b>	
A. Since the FCA was established, it seems that the number of fish in Funafuti Lagoon has increased, the fish are bigger, and it is easier now to catch fish than it was before.	17
B. Because people are not allowed to fish inside the FCA, it is more difficult to catch fish now.	2
C. The number of fish is still the same, they are the same size, and it is just the same catching fish as it was before.	4
No answer	2
<b>Question #5:</b>	
A. As a result of the establishment of the FCA, it seems that the numbers of coconut crabs and birds on the islets are increasing.	17
B. I don't think there are more coconut crabs and birds now, than there were before the FCA.	6
No answer	2
<b>Question #6:</b>	
A. The FCA was set up with the full cooperation and support of the people of Funafuti.	21
B. Some people came to Tuvalu and told us that it would be a good idea to have a conservation area, so we just did what they told us to do.	2
No answer	2

QUESTIONS / STATEMENTS	Responses
<b>Question #7:</b>	
A. I agree that the FCA is a good idea. It is important to protect a part of the lagoon so that fish and other animals can breed and reproduce, so there will always be enough fish.	25
B. I do not agree that the FCA is a good idea. Fishermen of Fongafale should be allowed to fish wherever they want to in the lagoon. There will always be plenty of fish in the lagoon, so it is not fair to stop them from fishing.	0
<b>Question #8:</b>	
A. The FCA should be managed by scientists who understand the best way to do it.	2
B. The FCA should be managed by local people. If they need assistance in managing the FCA, some advisers can also be asked to help.	23
<b>Question #9:</b>	
A. I would like to find out more about the FCA.	10
B. I would be willing to help to work on the management of the FCA as a community volunteer.	14
C. I am not interested in the FCA.	0
No answer	1
<b>Question #10:</b>	
A. If fishermen agree not to go into the FCA, and then they are caught going into the FCA to catch fish, then they should pay a fine or go to jail.	11
B. Fishermen should not be harshly punished for violating rules about fishing in the FCA, because they are only trying to feed their families. The rules need to be changed.	0
C. Fishermen who violate the FCA regulations need to be better informed so that they understand why they should not fish inside the protected area. Therefore these fishermen should be given some lessons on conservation, and should then be required to do community service to help promote conservation.	14
<b>Question #11:</b>	
A. If there are plenty of fish in the FCA, fishermen should be willing to pay a fee to get a license, so that they can fish inside the conservation area.	20
B. Fishermen should be allowed to fish inside the conservation area for free, without a license, anytime they want to.	0
No answer / Disagree	5
<b>Question #12:</b>	
A. Fishermen should not be permitted to fish inside the conservation area under any circumstances.	12
B. If there are plenty of fish in the FCA, then fishermen should be permitted to fish at special times, so that they can fulfill their community obligations (for example, during feasts).	13
C. The FCA should be opened up for fishing at all times, with no limitations.	0

QUESTIONS / STATEMENTS	Responses
<b>Question #13:</b>	
A. If the FCA is opened for fishing on special occasions, it should be limited only to one fishing day every three to five years. Each fisherman must agree to stop once he has caught a certain number of kilograms.	7
B. If the FCA is opened for fishing on special occasions, it should be limited to no more than one or two days per year. Each fisherman must agree to stop once he has caught a certain number of kilograms.	13
No answer	5
<b>Question #14:</b>	
A. The kaupule may be able to raise money in the conservation area by charging fees for fishing licenses and through the development of the tourism business	22
B. It will not be possible for the kaupule to raise money in the conservation area.	2
No answer	1

WRITE ANY ADDITIONAL COMMENTS, OR EXPLAIN YOUR ANSWERS HERE:

### Interpretation of Responses

Respondents in the community group included teachers, schoolchildren, business people and professionals, landowners of islets within the FCA, civil servants, members of NGOs, and fishermen, among others. More of the respondents were male (n=15) than female (n=10), and more came from Funafuti (n=14) than the outer islands (n=11). Age distribution was fairly homogeneous from teen-age to elderly respondents. The responses from this group provide useful information about the effectiveness of the FCA project, as perceived by the general community. The responses are interpreted here, with respect to a number of key issues.

#### ***Awareness***

Almost all the respondents stated that they were aware of the FCA project. Awareness-building activities under the project helped to improve their understanding of the importance of coral reefs. One hundred percent of respondents correctly understood the conservation purpose of the FCA, and supported the concept.

#### ***Community-Based Planning and Management***

The majority of respondents felt that the FCA project had been conducted with a high level of community participation, and felt that the management of the FCA needed to be undertaken largely by the community itself. Nearly all stated that they are either interested in finding out more about the FCA, or becoming more involved through volunteer activities.

#### ***Enforcement***

All respondents thought that it was important to enforce the FCA as a no-take zone. About half felt that fines should be assessed against violators. The other half felt that violators should be given further awareness training and then perform conservation-related community service. None of the respondents supported the idea that violators should be treated with leniency, or that restrictions should be relaxed.

### ***Management Issues***

Several questions were posed regarding the possibility of opening the FCA to periodic fishing. Some respondents declined to choose on of the multiple-choice answers offered, and instead wrote in that they disagreed that the FCA should ever be opened to fishing.

Most respondents felt that there was a possibility to generate revenues through sustainable, managed use of the FCA, for example, for ecotourism.

### ***Tangible Benefits***

Nearly all respondents felt that there were tangible increases in the numbers of fishes, birds, and turtles since the establishment of the protected area.

## Annex E: Field Survey Reports

Presented here are reports of the underwater surveys and transects conducted at five sites within Funafuti Lagoon: Tefala, Fualopa, Fuafatu, Tepuka, and South Fongafale. Of these, three sites (Tefala, Fualopa, and Fuafatu) are within the FCA. Another site, Tepuka, was a designated control site that is situated just north of the FCA. The last site, at South Fongafale, was not one of the original control sites, but was added to provide a comparison between sites that are distant from the main population center (all of the FCA sites and controls) and sites that are close to the main settlement (the South Fongafale site is directly adjacent to the most heavily populated islet in Tuvalu).

Findings have been summarized and are presented in narrative form. In addition, the semi-quantitative data recorded for all sites is tabulated and presented in Table E-1, which follows the narrative descriptions and discussion.

### **12 March 2003**

#### **Site Visit, Tefala Islet, Funafuti Conservation Area (Accompanied by Kilita Nokisi [Conservation Office] and Fuli Siasoi [Fisheries Department])**

A SCUBA survey was conducted on a lagoon-side reef at Tefala islet. Tefala islet had been reported as a site where fishing pressure was quite low since the establishment of the FCA (Kaly et al. 1999). Maximum dive depth was 10 meters (30 feet). Substrate was a mix of large coral outcrops ("bommies") patch reef, and sand bottom. Although a transect survey was intended, problems with the transect line led to abandonment of that effort. An informal survey, with non-quantified visual observations of fish and corals, was conducted. No attempt was made at relocating the exact site in which prior monitoring activities had been conducted, but both accompanying divers, who had participated in prior monitoring events, indicated that the site selected was in the same general area as those prior surveys. Seas were generally calm and water clarity was excellent, with visibility estimated at well over 30 m (100 ft).

Coral cover ranged from 0% in sand-bottom areas to 85-100% on coral reef outcrops and areas of patch reef. Dominant growth forms for corals were tabular and branching acroporas. Corals were generally in good and healthy condition, but noticeable algal turf and 'scuzz' was observed growing on corals in some areas. This may indicate some stress on corals from exogenous factors (possibly bleaching or disease). Only a few other non-coral invertebrates were noted (eg, a large sea cucumber [*Holothuria scabra*] and occasional mollusks).

Large, breeding-size individuals of important food fish species were common to abundant, and in fact were the dominant element of the reef fish community at this site. (This contrasts sharply to nearshore reefs adjacent to Fongafale, where smaller damselfishes, angels, chromids, wrasses, parrots, and surgeons are dominant, and larger predatory species are only seen occasionally). Among the notable species observed during the 30-minute dive (with some size estimates) were:

- a school of about 10-15 Big-eye emperors (*Monotaxis grandoculis*)
- large (60-70 cm) Long-nose emperors (*Lethrinus olivaceus*), often in small groups of 4-5 individuals
- a school of 20-25 Humpback snappers (*Lutjanus gibbus*)
- a medium size (55 cm) Humphead parrotfish (*Bulbometopon muricatum*)
- a large individual (110 cm) Napoleon wrasse (*Cheilinus undulatus*)

- several large individuals of an unidentified species of sweetlips (Family Haemulidae, local name *fangamea*, up to 85 cm), apparently guarding breeding territory
- Peacock groupers (*Cephalopholis argus*) of varying size (up to about 45 cm)
- a large Marbled grouper (*Epinephelus polyphekaidon*, 100 cm)
- a large Red snapper (*Lutjanus bohar*, 75 cm)
- several large Vermiculated rabbitfish (*Siganus vermiculatus*)
- a Black-tipped reef shark (*Carcharinus melanopterus*; 190 cm) with attached Remora (*Echeneis naucrates*)

In addition to the larger species noted above, smaller reef fishes that were observed included juveniles of the Greasy grouper (*Epinephelus tauvina*), Moorish idols, angels, surgeons, butterflyfishes (*Chaetodon* spp.), bannerfish (*Heniochus* sp.), puffers, butterflyfish (*Pentapodus* sp.), fusiliers (Caesionidae), banded sergeant-majors, chromids, damselfishes, and cardinalfishes (*Apogon* spp.), among others.

As is to be expected in this region, the observed reef area did not show extremely high overall diversity in fishes, corals, and other invertebrates (for example, as compared to reefs of Southeast Asia). However, the observed dominance of large predatory fishes at the site was remarkable. These fishes showed no wariness toward divers, were easily approached, and in fact sometimes actively approached divers, perhaps out of curiosity or in defense of territory. The presence of so many large fish that are choice target food species, and their behavior, seems to indicate that there is very low fishing pressure at this site.

### **17 March 2003**

#### **Site Visit, Fualopa Islet, Funafuti Conservation Area (Accompanied by Semese Alefaio [Conservation Office])**

A SCUBA survey was conducted on a lagoon-side reef at Fualopa islet. Fualopa had been reported as a site where fishing pressure was high, even after the establishment of the FCA (Kaly et al. 1999). Maximum dive depth for the survey was around 6-7 meters (20 feet). Substrate was a coral reef slope, and sand bottom with interspersed smaller coral heads. Two 30-m (100 ft)-long transect lines were set in the area. The first was along the margin of a shallow reef slope, running from about 2-7 m (6-20 feet) depth. The second traversed some smaller coral outcrops and sand bottom at a depth of about 5-6m (15-19 ft). Seas were calm and underwater visibility was less than 15m (50 ft).

Two passes were made along each transect line by two divers, observing first for fishes and then for corals and other invertebrates. Rather than attempting to replicate the more detailed monitoring surveys that had been conducted by earlier survey teams, the present transects were used simply to 'spot check' the overall condition of the reef, and get a sense of the relative abundance and diversity of major groups of fishes, corals, and other invertebrates. For each taxon observed along each of the transects, the higher of the two numeric values recorded by the two divers was used for the final data set (except for categories recorded as percentages, which were averaged).

The overall quality of the reef at Fualopa was much poorer than at Tefala. The reef slope was mostly covered with algae (algae accounted for about 60-80% of total area along the transects). The green alga, *Microdictyon*, was the dominant life form on the reef. *Halimeda* was also plentiful, and crustose red algae were also present. Blue-green filamentous algae ('scuzz') also covered a significant area of the reef. Dominant corals were primarily small colonies of massive

growth form, rather than the branching types that were found at Tefala. Live hard coral cover on the reef slope areas was only in the 15-25 percent range. The small conch, *Strombus luhuanus*, was quite common, especially in sand-bottom areas. Only two small individuals of giant clam (*Tridacna squamosa*) were seen.

Fishes were generally small in size and not especially plentiful. Some larger food fishes, including a pair of blue trevally (*Caranx melampygus*), and a group of about 10 green jobfish (*Aprion virescens*, Lutjanidae), all in the size range of around 40-70 cm, were observed in relatively open water along the second transect line. Several medium-sized (30 cm) peacock groupers, *Cephalopholis argus*, were seen. Apart from these few fish of larger size, the remainder of fishes observed were typical smaller-size coral reef-dwelling species, including surgeons, wrasses, goatfishes, angels, fusiliers, juvenile groupers and emperors, damsels, chromids, and butterflyfishes, among others. Total fish biodiversity and biomass for this area was relatively low.

Conditions at Fualopa suggest that the area is under continuing fishing pressure. Local residents explain this as being a result of the fact that Fualopa is considered a traditional fishing ground, thus, it is more difficult to convince people to give up fishing there, despite the existing regulations. The site is also readily accessible and more easily navigable than some other areas within the CA, due to the presence of a blasted and dredged channel near to the islet. These factors, in combination with the fact that policing of the area, especially at night, is minimal, may lead to increased poaching and the current depleted condition of the fisheries resources here.

### **21 March 2003**

#### **Fuafatu Islet, Funafuti Conservation Area (Accompanied by Semese Alefaio [Conservation Office])**

A snorkel survey was conducted at a lagoon-side coral reef site at Fuafatu Islet within the Conservation Area. The survey was conducted during an extreme low tide, in calm seas, with water visibility of about 16m (50 feet). Depths in the area surveyed ranged between 1 m and 7 m. Overall, the site was perhaps the richest of those surveyed in terms of biodiversity, coral health, and the presence of large individuals of upper-tier predatory fish species. A transect line was not used for the survey; rather, two snorkelers recorded their field-of-view observations while moving slowly over various sections of the reef.

Overall reef structure was more complex than at any of the other sites visited, with steep walls and ledges on the coral outcrops descending to the sand-bottom lagoon floor. Total live coral coverage on coral outcrops was about 85% (60 percent branching acroporids, 15 percent table acroporids, and 10 percent massive corals). About 10 percent of the reef area was occupied by crustose algae, algal turfs, and scuzz, and the remainder of the reef (5%) was abiotic (dead coral and rubble).

Dominant target food fish species observed included the following:

- two very large (100 cm) marbled groupers (*Epinephelus polyphekaidon*)
- a very large (85 cm) plus several medium-sized (50-60 cm) peacock groupers (*Cephalopholis argus*)
- numerous large (over 70 cm long) red snappers (*Lutjanus bohar*)
- a school of about 100 Humpback snappers (*Lutjanus gibbus*)
- two large napoleon wrasses (*Cheilinus undulatus*)



- a large bluespine unicornfish (*Naso unicornis*) and several orangespine unicornfishes (*N. litturatus*)
- large goatfishes (*Parupeneus* sp.)
- several large schools of rabbitfishes (mostly *Siganus argenteus*)
- several large (65 cm) Humphead parrotfish (*Bulbometopon muricatum*)
- Black-tipped reef shark (*Carcharinus melanopterus*)

A variety of other smaller reef fish species (butterflyfishes, angelfishes, damsels, chromids, wrasses, cardinalfishes, among others) were also noted. In addition to the fishes, a small green sea turtle (*Chelonia mydas*) swam across the snorkelers' path during the survey. Several very large (50cm length x 12 cm diameter) holothurians and a number of giant clams (*T. maxima* and *T. squamosa*) were seen. It was reported by the Conservation Officer that several sea cucumbers had been transplanted to the site from deeper waters, so possibly the ones observed were these transplanted individuals. One of the *T. maxima* observed was an individual that had been transplanted three years prior, and had reportedly grown considerably since transplantation (present size about 30 cm maximum valve length).

The abundance of very large individuals of prime food fish species appears to indicate that very little or no fishing pressure is occurring at this site. This is further supported by the observation that a large-sized giant clam (another highly desirable food species) that had been transplanted to the site has been left undisturbed there for several years.

### **21 March 2003**

#### **Tepuka Islet, Funafuti Lagoon (Accompanied by Semese Alefaio [Conservation Office])**

A snorkeling survey was conducted at a lagoon-side coral reef site at Tepuka Islet, one of the areas outside the Funafuti Conservation Area that was selected as a 'control' site for the previous monitoring surveys. The survey was conducted during an extreme low tide, in calm seas, with water visibility of about 14m (40 feet). A transect line was not used for the survey; rather, two snorkelers recorded their field-of-view observations while moving slowly over various sections of the reef.

The site consisted mostly of dense patch reef of branching acropora growing to within a few centimeters of the water surface at low tide. Patches of coral were interspersed over the sandy lagoon floor. The survey area was shallow, ranging from about 1 m to 3 m maximum depth. Overall condition of the reef was excellent, though less diverse than at Tefala or Fuafatu—nearly 100 percent of the live coral at this site is branching acropora.

Fish fauna was fairly diverse and abundant. Among the principal target species noted were:

- several medium sized (30-40 cm) peacock groupers (*Cephalopholis argus*)
- a small group of medium sized (30 cm) emperors (*Lethrinus* sp.)
- several blue-lined snappers (*Lutjanus kasmira*)
- a school of about 60 Forktail rabbitfishes (*Siganus argenteus*)
- several large (65-75 cm) Humphead parrotfishes (*Bulbometopon muricatum*)
- a large (90 cm) Napoleon wrasse (*Cheilinus undulatus*)

Among the interesting reef fishes seen here (in addition to the more frequently observed inhabitants) were longnose butterflyfishes (*Forcipiger flavissimus*; during these surveys, observed only at this site), Titan triggerfish (*Balistoides viridescens*), Bicolor angels (*Centropyge*

*bicolor*), Sailfin surgeonfish (*Zebrasoma veliferum*), Longnose filefish (*Oxymonacanthus longirostris*), and porcupinefish (*Diodon hystrix*).

### **22 March 2003**

#### **South End, Fongafale Islet, Funafuti Lagoon**

A snorkeling survey was conducted at a lagoon-side coral reef site at the south end of Fongafale Islet, the main inhabited islet of Funafuti Atoll. The area is outside the Funafuti Conservation Area, and while this was not one of the areas selected as a 'control' site for the previous monitoring surveys, it was felt that a survey here would be useful in drawing comparisons regarding overall biomass and biodiversity as seen at sites within and outside the conservation area, and in close proximity to, vs. distant from, the main population center.

The survey was conducted at high tide by taking two passes over an unmarked transect approximately 50 m in length. The alignment of the transect ran approximately parallel to the shoreline in a north-south direction. Corals and other sessile biota, and fishes within the field of view, were noted. Water depth averaged from 3-4 m. Seas were calm and visibility was about 12-13 m (40 ft).

In structure, the reef is a nearly continuous fringing reef. The living coral reef community at the site (about 85% of total area) consists largely of branching acroporids (80 percent of reef area), with occasional interspersed table acroporids and massive corals (about 5 percent of area), some of which attain fairly large diameter (up to 1.5m or more). Growing deep among the coral branches are fairly thick algal turfs comprising a number of different types, including green, red and brown algae (*Halimeda* spp., *Asparagopsis taxiformis*, and *Dictyota* sp., respectively). Corals are in fairly healthy condition, with little evidence of bleaching or abnormal algal overgrowth. Algae and abiotic patches account for the remaining 15% of the total reef area.

Among the target fish species observed at the site were:

- several large schools (up to 100 individuals) of Forktail rabbitfishes (*Siganus argenteus*)
- very large schools (several hundred individuals) of Convict tang or manini (*Acanthurus triostegus*)
- large aggregations of small to medium-size surgeonfishes and parrotfishes (various species, Acanthuridae and Scaridae)
- large schools of fusiliers (*Caesio* sp.)
- several medium sized Peacock groupers (*Cephalopholis argus*) up to 35 cm length
- a number of large size (to 45 cm) big eye emperors (*Monotaxis grandoculus*)
- a group of 5 subadult Napoleon wrasses (*Cheilinus undulatus*; up to 65-70 cm length)
- Long-jawed squirrelfishes and soldierfishes (*Sargocentron spiniferum*, and *Myripristis* spp.) occurring individually or in small groups
- numerous rudderfishes (*Kyphosus cinerascens*)
- two large (about 50 cm) Bluefin trevallies (*Caranx melampygus*)
- an unidentified species of large (35 cm length) goatfish (*Parupeneus* sp.), with distinctive blue-violet coloration on the dorsal area
- a Rainbow runner (*Elagatis bipinnulatus*) moving through open water above the reef

In addition to these food fishes, other reef-associated fishes noted here included needlefishes (Belonidae, occurring near the surface in groups of several dozen individuals), a large school of White-bellied damsels (*Amblygliphidodon leucogaster*), Moorish idol (*Zanclus cornutus*),

Lemonpeel angels (*Centropyge flavissimus*; quite common at this site), Regal angel (*Pygoplites diacanthus*), small wrasses (Labridae), flagfish (*Heniochus* sp.), chromids (Chromidae), Longnose filefishes (*Oxymonacanthus longirostris*), and various butterflyfishes (Chaetodontidae).

Certain human impacts are evident here, as opposed to the other sites surveyed on the far side of the lagoon: at the Fongafale site, there is quite a bit of litter and refuse (eg, plastic, discarded pieces of metal and machine parts) both along the shore and to lesser extent, in the water and among the corals. Levels of nutrients and other pollutants may be higher here due to runoff from the nearby urban center (although no water quality tests were conducted to confirm this). In addition, this site is regarded as a favored fishing spot, and access to the site from the town center is easier than at any of the other more distant sites surveyed. Despite these conditions, this site presents a very rich reef habitat. The abundance (biomass) of fish at this site is comparable to or possibly even higher than at the best sites within the conservation area. The diversity of fishes is also relatively high. However, for the more desirable target species, the average size of fishes at this site appears to be somewhat smaller than at the best sites within the conservation area. Diversity of corals and invertebrates is relatively low.

## Discussion

The general condition of reefs and fisheries resources at most of the conservation sites surveyed ranged from very good to excellent. Particularly at Tefala and at Fuafatu, the abundance of fish (biomass), together with the large size of the individuals present, suggests that fishing pressure at these sites is very low. Corals were also quite complex and generally in good health at these sites. However, this contrasted sharply with conditions observed at Fualopa, where corals were heavily overgrown with algae (mostly the green alga, *Microdictyon*). Fish biomass and diversity of species was extremely low here. These observations suggest that the biota at Fualopa are under stress, but it is not clear what the cause of this is. It has been suggested that this site is favored by poachers, and is being heavily fished. If that is so, it would explain the low fish biomass and diversity. Possibly, damage due to dragging of anchors has had an impact on the sessile reef organisms at the site. Other possible causes of the poor reef condition could be bleaching or disease.

Interestingly, the condition of reefs that were surveyed outside the conservation area is also very good to excellent. Fish fauna and coral reef condition at Tepuka was roughly comparable to that observed at the best CA sites, Tefala and Fuafatu. Even at South Fongafale, despite its proximity to the main settlement, the variety and abundance of fish was very high (S. fongafale has perhaps the highest fish biomass of any of the sites surveyed), and corals on this long fringing reef are in very good condition. The only parameter that appeared to be different at non-FCA sites was fish size—at South Fongafale, on average, the sizes of individual fishes is smaller than the same species seen at Tefala or Fuafatu.

These observations appear to indicate that fisheries resources in most of the FCA are in good condition and breeding populations of several important food fish species are established. However, there are still pressures that are adversely affecting fisheries resources and corals in some sites within the FCA, pointing to the possibility of continuing poaching activities. The high fish biomass and diversity observed at sites outside of the FCA points to two possibilities— (i) that the FCA may already be exporting fish biomass to other parts of the lagoon, and/or (ii) that fishing pressure throughout the lagoon may be lower than previously believed.

Table E-1 Summary of Transect Survey Data

	Locations/Transects (T) or Surveys (S)					
	Tefala	Fualopa		Fuafatu	Tepuka	S. Fongafale
	S1	T1	T2	S1	S1	T1
<b>Corals –Algae-Sponges</b>						
<b>Branching <i>Acropora</i></b>	45%	6 colonies	3 colonies	55%	75%	80%
<b>Table <i>Acropora</i></b>	30%	--	--	20%	10%	3%
<b>Other Corals</b>	20%			15%	10%	2%
<i>Porites</i>		11 colonies	7 colonies			
<b>Other Massive</b>		3 colonies	7 colonies			
<b>Foliose Coral</b>		--	--			
<b>Other sessile biota</b>				10%	5%	15%
<b>Sponge</b>		6	13			
<i>Halimeda</i>		20%	15%			
<i>Microdictyon</i>		35%	35%			
<i>Caulerpa</i>		3 clumps	2 clumps			
<b>Crustose red algae</b>		8%	8%			
<b>Scuzz</b>	5%	15%	10%			
<b>Other Invertebrates</b>						
<b>Giant clam</b>		2	--	1lg transplanted		
<b><i>Strombus</i></b>		3	18	few in sand		
<b>Urchins/Cucumbers</b>	1	--	--	3-4 large	--	
<b>Fishes</b>						
<b>Jacks</b>	--	--	2 large			2 lg. bluefin trevally
<b>Groupers</b>	argus, various sizes lg marbled-1m juv. tauvina	2 small	1 medium 3 small	2 x-large marbled 1 large argus 85cm few medium	sev. medium argus	sev. medium argus
<b>Emperors</b>	school of bigeye group of longnose	3	1		group of medium sized emperors	group of lg. bigeye
<b>Snappers/Jobfish</b>	school of gibbus sev. lg. bohar	--	7 lg jobfish	numerous lg. bohar; lg. school gibbus	blue-lined	lg. schools of gibbus
<b>Rabbitfish</b>	vermiculated	--	--	lg. schools argenteus	school of argenteus	
<b>Parrotfishes</b>	1 humphead	27	8	lg.humpheads	lg. humpheads	
<b>Wrasses</b>	1 napoleon>1m	4	20	2 lg. napoleon	1 napoleon 90cm	5 subadult Napoleon
<b>Sharks</b>	1 black tip	--	--	black tip		
<b>Angels</b>	present	7	3		bicolor	
<b>Butterflyfishes</b>	present	--	3		approx. 8-10 Chaetodon spp., Forcipiger	
<b>Surgeons</b>	present	15	10	lg. unicornfish	abundant	very lg. schools of triostegus
<b>Fusiliers</b>	present	--	40		x-large school	lg. schools
<b>Goatfishes</b>	present	25	5	numerous, large sp		very large species
<b>Other Reef Fish/Vertebrates</b>		60	80	1 sea turtle		rainbow runners
Numbers indicate actual estimated counts of individuals or colonies; percentages indicate estimated percent cover for total transect (T) or survey (S) area.						

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**Annex F: Outline Terms of Reference:  
Advisory Technical Assistance for Improving Marine Conservation in Funafuti Lagoon**

The key recommendations of the Funafuti Conservation Area Case Study may be considered as an integrated package of targeted actions that can help to improve management of marine protected areas. Most of the recommendations pertain specifically to improving the management and operation of the FCA, while a few pertain to initiating management efforts on the outer islands or in other nearby nations.

Confining attention to those recommendations specifically for Tuvalu, the GOT does not yet possess the capability to fully carry out these actions on its own; advisory technical assistance will be required to help to prepare the community, to train assigned personnel, and to help coordinate a range of community-based planning, design, and management functions. It is proposed that international specialists be retained for a total of 16 person-months. It is estimated that the technical assistance should be conducted over a period of three years. Costs for this assistance will be approximately US\$450,000. Funding sources for this assistance are still to be determined, however, it can be reasonably assumed that funds will be sought from one or more of the likely sources identified in Section 5.2.7.

The following are the positions recommended for the team of technical specialists, the estimated duration of their assignments, and the specific tasks that they are to perform:

**1. Coastal Resources Management and Protected Area (CRM/PA) Specialist (Team Leader): 7 person-months**

- Review monitoring protocol currently being used in the FCA, and make necessary improvements to the methodology, possibly to include installation of permanent monitoring transects or quadrats.
- Train local personnel in biological monitoring and survey procedures. Also design brief overseas training course for several key conservation managers.
- Working closely with the Tourism Development and Marketing Specialist, investigate potential mechanisms for sustainable financing.
- Strengthen the programs for building public awareness with respect to the management of the FCA. This will include developing exhibits, displays, and educational programs for the public at the FCA Interpretive Center. Linkages will also be established with the public schools to initiate a program of curriculum enrichment in the area of environmental science and marine conservation.
- Working closely with the Community Development Specialist, guide the community in the design of an integrated marine and coastal resources management plan for Funafuti Lagoon. Employ such techniques as community mapping and participatory coastal resource appraisal to engender enthusiasm, support, and a sense of community ownership for the planning process.
- Investigate the potential to establish new conservation areas on other islands in the country, and begin to plan and implement these areas.
- Working closely with the legal specialist, determine ways in which conservation priorities can be mainstreamed into overall national policy-making and economic planning.

## **2. Tourism Development and Marketing Specialist: 3 person-months**

- Working closely with the CRM/PA specialist, conduct a comprehensive study of the potential for dive tourism and ecotourism. Map the key areas for diving within the FCA, other parts of Funafuti Lagoon, and in outer island lagoons. Describe barriers and opportunities.
- Define advantageous marketing strategies and niches.
- Working closely with the CRM/PA specialist, develop structures to capture revenues from dive tourism, to be applied for sustainable financing of conservation and protected area management.

## **3. Community Development Specialist: 4 person-months**

- Conduct a social inventory and needs assessment to determine the current state of community organization, and especially the condition of NGOs and CBOs, and specifically any organizations having a focus on environmental management and natural resources management.
- Develop a framework to strengthen relevant NGOs and CBOs.
- Working closely with the CRM/PA specialist, help to guide the planning and production of an integrated, community-based marine and coastal resources management plan.

## **4. Monitoring, Control, and Surveillance (MCS) Specialist: 1 person-month**

- Review the current status of enforcement efforts in the FCA.
- Define requirements for manpower and equipment that would be needed to improve the effectiveness of enforcement activities in the FCA.
- Working with the CRM/PA Specialist, delineate FCA boundaries, and design and deploy markers.
- Help to develop a community-based patrol force. Develop guidelines and train the first group of community wardens.
- Provide input to the legal specialist for drafting or revising legislation.

## **5. Legal Specialist: 1 person-month**

- Review the laws and by-laws pertaining to management and permitted practices in the FCA.
- Harmonize all laws, by-laws and regulations, and revise existing or draft new legislation as required.
- Work closely with the MCS specialist to ensure that a workable system is put in place to effectively try and prosecute offenders who violate FCA regulations.